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ABSTRACT

Competency-based teacher and student materials are provided for three units on safety skills as part of a diesel technology curriculum. The units cover the following topics: general safety; workplace safety; and first aid. The materials are based on the curriculum-alignment concept of first stating the objectives, then developing instructional strategies for teaching to those objectives, and finally, assessing to those same objectives. The teacher pages contain some or all of the following components: suggested activities, transparency masters, teacher supplements, answers to assignment sheets, written test, answers to written test, and unit evaluation form. Student pages include objective sheets, information sheets, student supplements, assignment sheets, and job sheets. Both teacher and student pages, as well as introductory pages, are included in the teacher edition. In addition to the general information such as the table of contents, foreword, and acknowledgments, the following information is included in the introductory pages: use of the publication; competency profile; instructional and task analysis; related academic and workplace skills list; and NATEF crosswalk, which identifies the National Automotive Technicians Education Foundation tasks covered in the publication by unit number and job sheet number. Contains 18 references. (KC)

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Diesel Technology

Safety Skills

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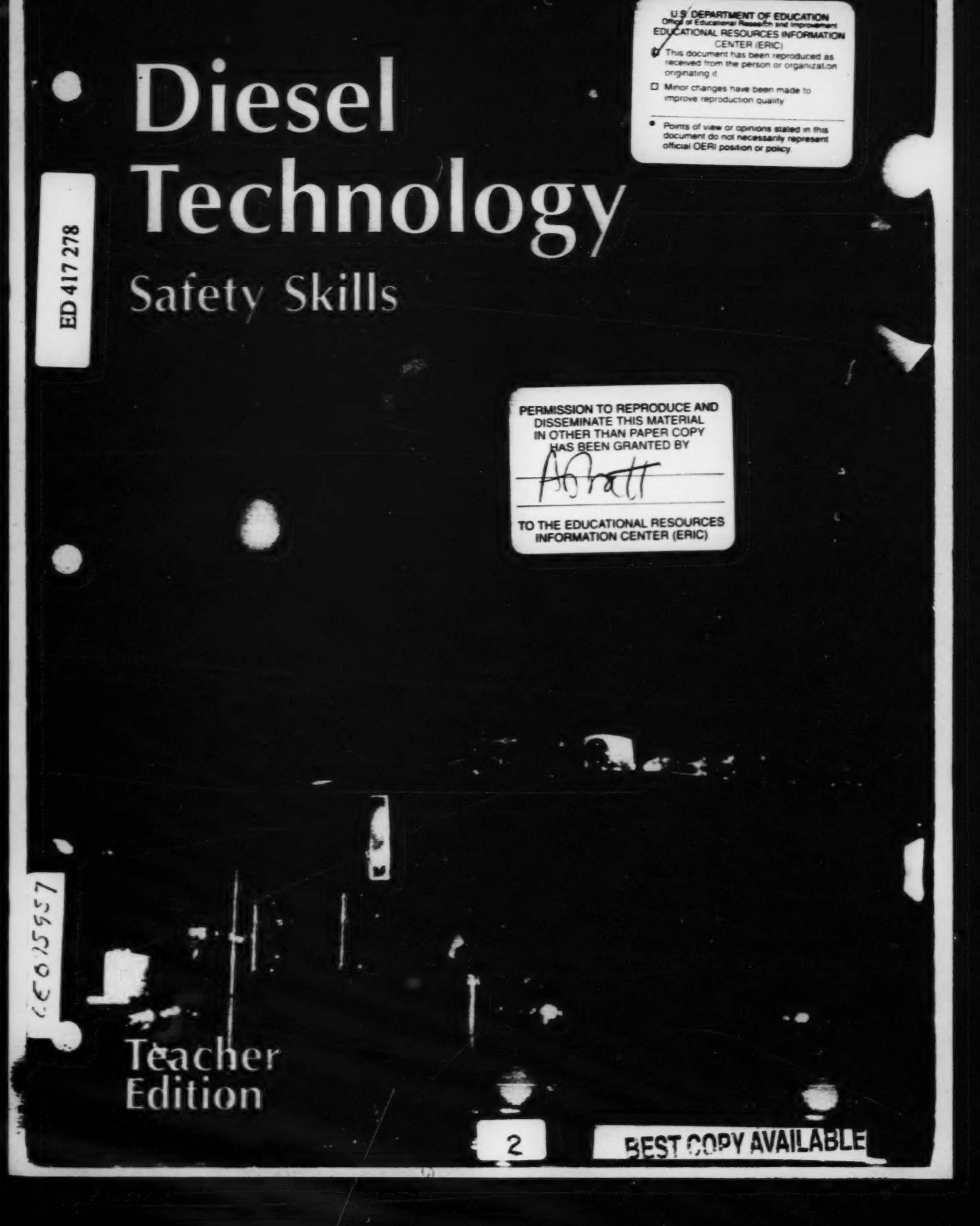

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Teacher Edition

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Diesel Technology: Safety Skills

Written by

Mary Kellum

Developed by

The Multistate Academic and Vocational Curriculum Consortium, Inc.
(MAVCC)

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Teacher Edition

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Foreword

When MAVCC began the process for revising its diesel mechanics series, we wanted to develop a set of instructional materials that would provide students with the cognitive (knowing), psychomotor (doing), and affective (attitude) skills necessary to be successful in the diesel trade and that would address the emerging technology in the field. With the help of extremely qualified teachers, industry representatives, and writers, our new diesel technology series offers secondary and postsecondary students an excellent opportunity for learning required skills in the diesel industry.

The series aligns with the medium/heavy duty truck task list developed by the National Automotive Technicians Education Foundation (NATEF) and used by the National Institute for Automotive Service Excellence (ASE) in the certification of medium/heavy duty truck technicians. Our series addresses all but one of the ASE certification areas, gasoline engines, and includes the following publications: *Introduction, Safety Skills, Workplace Skills, Brakes, Steering and Suspension, Engines, Electrical and Electronic Systems, Air Conditioning, Drive Trains,* and *Hydraulics*. Each publication will include a matrix showing where the NATEF tasks are being taught.

The new publications will also reflect those tasks identified by MAVCC's technical committee which were not covered in the NATEF task list, especially those dealing with the maintenance and repair of diesel-powered heavy equipment and farm equipment.

The skills presented in this publication, *Diesel Technology: Safety Skills,* will be useful to any student pursuing a career in the diesel industry. Today, safety skills are mandatory to be successful in the workplace.

These instructional materials are designed for student use and to assist teachers in organizing and improving instruction. Their design is based on the curriculum alignment concept of first stating the objectives (objective sheet), developing instructional strategies for teaching to those objectives (information, assignment, and job sheets), and assessing to those same objectives (criterion-referenced evaluation instruments).

As with all MAVCC publications, teachers are encouraged to localize and personalize these materials to meet the needs of individual students, the community, and prospective employers. Teachers are also encouraged to develop strategies for motivating their students.

A chart (page xxi) which classifies and defines each of the academic and workplace skills and competencies has been included in the teacher edition and reflects key elements from *What Work Requires of Schools: A SCANS Report for America 2000,* a 1991 study by the U.S. Department of Labor; *Workplace Basics: The Skills Employers Want,* a three-year study conducted jointly by the American Society for Training and Development (ASTD) and the United States Department of Labor (DOL); and other national and state sources. These tools have been provided in an effort to help educators identify and document where basic academic and workplace skills are being taught. By reinforcing these skills, the teacher should assist students in improving their employability skills.

Special attention should be given to the matrix (page xxiii) identifying basic academic and workplace skills being reinforced in these instructional materials as well as the teaching suggestions on ways to reinforce these skills found in the teacher pages for each unit.

As you use these instructional materials, we hope that you will find that they contribute to the quality of your program. If any problems occur or if you have any suggestions for improvement of the materials, please call or write us.

Ben Clay, Chairman
Board of Directors
Multistate Academic and Vocational
Curriculum Consortium

Dr. Clark R. Harris
Executive Director
Multistate Academic and Vocational
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Use of Introductory Materials

Introductory materials are included in the teacher edition only and contain useful information to assist administrators and teachers in planning for instruction.

In addition to the general information such as the table of contents, foreword, and acknowledgements page, information is included on the following:

1. **Use of this publication**—Explains the components of a unit of instruction and how they should be used as part of the teaching/ learning process.

2. **Competency profile**—Provides a record of student performance for each task included in a unit of instruction. This becomes a part of the student's permanent records and should be utilized when directing the student toward employment opportunities.

3. **Instructional/task analysis**—Provides a quick review of contents of the publication; identifies cognitive (knowledge) skills and psychomotor (doing) skills addressed in each unit of instruction.

4. **Related academic and workplace skills list**—Classifies unit tasks (assignment sheets and job sheets) according to related academic and workplace skills and competencies being reinforced. Skill areas reflected by skill groups, sub skills, and definitions have been identified using *What Work Requires of Schools: A SCANS Report for America 2000* and *Workplace Basics: The Skills Employers Want*.

5. **Reference list**—Provide a comprehensive list of resources used in the development of this publication.

As you use these materials, it is hoped that they will provide useful information to meet a variety of needs.

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Use of This Publication

Diesel Technology: Safety Skills contains three units of instruction. For the teacher edition, the pages are divided into teacher pages and student pages. These include the following:

Teacher Pages	Student Pages
Suggested Activities	Objective Sheet
Transparency Masters*	Information Sheet
Teacher Supplements*	Student Supplements*
Answers to Assignment Sheets*	Assignment Sheets*
Written Test	Job Sheets*
Answers to Written Test	
Unit Evaluation Form	

* *Designates components that may not appear in every unit of instruction*

The complete teacher edition consists of both teacher pages and student pages, as well as the introductory pages. Student pages focus on measurable and observable learning outcomes. Teacher pages provide evaluation tools and suggestions on ways to supplement, localize, personalize and motivate in order to present a complete teaching/learning process.

MAVCC instructional materials are competency-based, not time-based. Students should be allowed to work until they master each competency.

Units of instruction are designed for use in more than one lesson or class period. Careful study of each unit of instruction by the teacher will help to determine the following:

- Amount of materials that can be covered in each class period
- Skills that must be demonstrated
- Amount of class time needed for teacher demonstrations
- Amount of time needed for student practice and return demonstrations of mastered skills
- Supplies and equipment required for assignment sheets and job sheets
- Supplementary materials (videotapes, kits, reference books, etc.) that must be ordered
- Resource people who must be contacted

Suggested activities (teacher component)

The suggested activities assist teachers during the preparation stage of the teaching/learning process by providing an instructional plan, teaching suggestions, and a list of resources. Ways to integrate academic and workplace skills have been included in the teaching suggestions, and skill areas have been noted in bold. The teacher should read the suggested activities before teaching the units. Time should be allowed to obtain supplemental materials, prepare audiovisual materials, and contact outside resources. Duties of the teacher will vary according to the particular unit.

Instructions for evaluating student performance on the job sheets are also included in this component. Teachers should select and discuss with students the rating scale that will be used.

To assist a teacher in obtaining suitable supplemental materials, references used in the development of each unit are listed in this component, along with suggested supplemental resources such as books, posters, pamphlets, videotapes, and computer software.

Transparency masters (teacher component)

Transparency masters are used to direct the students' attention to the topic of classroom discussion. They may provide illustrations, charts, schematics, or additional information needed to clarify and reinforce objectives included in the unit of instruction.

Teacher supplements (teacher component)

Teacher supplements are optional materials for the teacher to use. They have three purposes: to provide the teacher with higher level materials to stretch the advanced student, with remedial information or practice to assist the less-advanced student, and with state-of-the-art information in which the teacher may not have background or with information that is not readily available in other books. Some teacher supplements may be duplicated for student use and are marked accordingly.

Answers to assignment sheets (teacher component)

These are designed to assist the teacher in evaluation of student performances.

Written test (teacher component)

This component provides criterion-referenced evaluation of every cognitive objective listed in the unit of instruction. The written test may be duplicated for student use. If objectives have been added, deleted, or modified, appropriate changes should be made on the written test. Tests may be divided into shorter tests covering three or four objectives at a time and given soon after those objectives have been covered. A selection of test items from the units covered may be used for final tests at the end of each term if desired.

Answers to written test (teacher component)

These are designed to assist the teacher in evaluation of student performances.

Unit evaluation form (teacher component)

This sheet provides teachers with a record of each student's performance on a unit of instruction. It includes space for assignment sheet ratings, job sheet ratings, written test scores, and teacher comments. The unit evaluation form may be duplicated.

Objective sheet (student component)

Each unit of instruction is based on performance objectives which state the goals for successful completion of the course. These performance objectives are stated in two forms: unit objectives which state the expected performance of each student after completion of the unit of instruction, and specific objectives which state what the student must do to reach the unit objective.

The objectives should be stressed throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods. Teachers should prepare for each unit by deciding how each objective can best be taught.

Teachers should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When objectives are added, the teacher should remember to supply the needed information, assignment and/or job sheets, and written test items.

Information sheet (student component)

The information sheet provides the content essential for meeting the cognitive (knowledge) objectives of the unit. Teachers will find that the information sheet serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective. Students should read the information sheet before the information is discussed in class. Space is provided in margins for students and teachers to add notes that supplement, localize, personalize, or provide information for the teaching of each objective.

Student supplements (student component)

The information presented in a student supplement may consist of tables, charts, written information, forms, or other information students will need in order to complete one or more of the assignment and/or job sheets. Students are not directly tested over the information presented in a supplement; however, their ability to apply this information may be evaluated in the completion of assignment sheets or job sheets.

Assignment sheets (student component)

Assignment sheets provide students with paper and pencil activities that give students the opportunity to make practical application of the knowledge in the information sheet. Criteria are provided to objectively evaluate student performance.

Job sheets (student component)

Job sheets are an important segment of each unit. Job sheets provide potential employers with a picture of the skills being taught during training and the performances that might reasonably be expected from an individual who has had this training.

The job sheets provide criteria to objectively evaluate student performance, a list of required equipment and materials, and a step-by-step procedure for performing a psychomotor skill. The teacher should discuss the equipment and materials available in the classroom, laboratory, or shop and demonstrate the procedure prior to having students practice the procedure. When a student is ready to be evaluated, the teacher should follow instructions for evaluating student performance which may be found in the teacher edition (suggested activities component).

Competency Profile

Name: _____

Directions: Evaluate the student using the rating scale below. Write the appropriate number to indicate the degree of competency achieved. The descriptions associated with each of the numbers focuses on a level of student performance for each of the tasks listed. The written test scoreline is provided for optional teacher use. It may not be applicable in all cases.

Option A

Rating scale:
- 4 - Skilled - Can perform job with no additional training.
- 3 - Moderately Skilled - Has performed job during training program; limited additional training may be required.
- 2 - Limited Skill - Has performed job during training program; additional training is required to develop skill.
- 1 - Unskilled - Is familiar with process, but is unable to perform job.
- 0 - No Exposure - No information or practice provided during training program; complete training required.
- NA - Non-applicable.

Option B

Yes - Can perform with no additional training
No - Is unable to perform satisfactorily

Unit 1: General Safety

_____ 1. Subscribe to a safety pledge.
_____ 2. Apply general safety principles to the school and workplace.
_____ 3. Determine correct fire extinguisher to use for various situations.
_____ 4. Operate a fire extinguisher.
_____ 5. Lift a heavy object.
_____ 6. _____

_____Written Test Score

Unit 2: Workplace Safety

_____ 1. Interpret material safety data sheets.
_____ 2. Compile a list of hazardous materials found in your shop and provide additional information on the most common materials.
_____ 3. Apply the safety color code to diesel technology shops.
_____ 4. Identify workplace safety violations.
_____ 5. Complete an individual student shop safety inspection.
_____ 6. _____

_____Written Test Score

Unit 3: First Aid

_____ 1. Determine basic first aid measures for given emergency situations.
_____ 2. _____

_____Written Test Score

COMMENTS: _____

_____

_____

_____

_____

Evaluator: _____ Date: _____

*** Permission to duplicate this profile is granted.**

Instructional/Task Analysis

Related Information: What the Student Should Know	Application: What the Student Should Be Able to Do
Unit 1: General Safety	
1. Terms and definitions	19. Subscribe to a safety pledge
2. Ways of developing a good safety attitude	20. Apply general safety principles to the school and workplace
3. Expectations for a safe environment at school or work	21. Determine correct fire extinguishers to use for various situations
4. Basic types of emergencies	22. Operate a fire extinguisher
5. Severe weather guidelines	23. Lift a heavy object properly
6. Steps to follow in case of a bomb thread	
7. How to conduct a fire evacuation	
8. Personal protective equipment	
9. Personal safety guidelines	
10. Guidelines for maintaining a safe work area	
11. Causes of back injuries	
12. Lifting and moving items safely	
13. Components of a fire	
14. Classifications of fires and their fuel sources	
15. Types of fire extinguishers	
16. Fire extinguisher markings	
17. Steps in using a fire extinguisher	
18. Ways to prevent fires	

Related Information: What the Student Should Know	Application: What the Student Should Be Able to Do

Unit 2: Workplace Safety

1. Terms and definitions
2. Federal agencies that regulate hazardous materials and hazardous waste
3. OSHA's role in workplace health and safety
4. Hazard communication
5. Information on a chemical label
6. Information on a material safety data sheet (MSDS)
7. Characteristics of a hazardous material
8. Ways hazardous materials can enter the body
9. Short-term and long-term health effects from exposure to hazardous materials
10. Hazardous material diamond classification system
11. Hazardous materials that may be found in the diesel technology shop
12. Hazardous waste products associated with the diesel technology shop
13. Guidelines for storing and disposing of hazardous materials
14. Guidelines for using flammable materials and toxic substances
15. Equipment and tool safety guidelines
16. Electrical safety guidelines
17. Colors of the federal safety color code and their uses
18. Safety tags and their color codings
19. General safety guidelines for working on vehicles
20. Overview of asbestos and guidelines for reducing asbestos exposure

21. Interpret material safety data sheets
22. Compile a list of hazardous materials found in your shop and provide additional information on the most common materials
23. Apply the safety color code to diesel technology shops
24. Identify workplace safety violations
25. Complete an individual student shop safety inspection

Unit 3: First Aid

1. Terms and definitions
2. Major causes of accidents
3. Injuries that may occur in the diesel shop
4. Basic types of accident injuries
5. Steps for giving first aid
6. Times to call for emergency medical service
7. Information to give during an emergency phone call
8. Legal aspects of first aid
9. Contents of a first aid box
10. Bloodborne pathogens and special first aid precautions
11. Basic first aid procedures for various emergencies
12. Steps on how to treat choking
13. Guidelines for giving mouth-to-mouth breathing
14. Basic steps for performing cardiopulmonary resuscitation
15. Determine basic first aid measures for given emergency situations

Academic and Workplace Skills and Competencies
(Classifications and Definitions)

Foundation Skills		
Skill Groups	**Sub Skills**	**Definitions**
Basic Skills	Reading	Comprehending written information and analyzing, summarizing, and applying what has been read to a specific task.
	Writing	Communicating a thought, idea, or fact in written form in a clear, concise manner.
	Arithmetic/ mathematics	Performing basic computations, applying, estimating and reasoning skills, and solving practical problems using a variety of mathematical techniques.
	Science	Applying knowledge learned through study and practice that is based on scientific principles, methods, and techniques.
	Listening	Receiving, interpreting, and responding to oral messages and other cues.
	Speaking	Communicating a thought, idea, or fact orally in a clear, concise manner.
Thinking Skills	Creative thinking	Using imagination to generate new ideas.
	Decision making	Specifying goals and constraints, generating alternatives, considering risks, and evaluating and choosing the best alternative.
	Problem solving	Recognizing and defining problems, devising and implementing plan of action, and tracking and evaluating results.
	Seeing things in the mind's eye	Mentally organizing and processing symbols, pictures, graphs, and other information.
	Knowing how to learn	Using efficient learning techniques to acquire and apply new knowledge and skills.
	Reasoning	Applying a rule or principle underlying the relationship between two or more objects when solving a problem.
Personal Management Skills	Responsibility	Exerting a high level of effort towards goal attainment, working hard to become excellent at doing tasks by setting high standards, paying attention to details, and displaying a high level of concentration.
	Self-esteem	Developing self-confidence and maintaining a positive view of self.
	Career awareness, development and mobility	Assessing self accurately, setting personal goals, establishing and implementing a plan, and monitoring progress.
	Integrity/honesty	Choosing an ethical course of action when faced with making a decision that may break with personal or societal values and recognizing the impact of violating these beliefs and codes on an organization, self, and others.
	Organizational effectiveness	Adapting to the organization's goals, values, culture, and traditional modes of operation.

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Competencies		
Competency Groups	**Sub Skills**	**Definitions**
Resources	Time	Selecting relevant, goal-related activities, ranking them in order of importance, allocating time, and understanding, preparing, and following schedules.
	Money	Using or preparing budgets, making forecasts, keeping records, and making adjustments to meet objectives.
	Material and facilities	Acquiring, storing, and using materials and space efficiently.
	Human resources	Assessing skills and distributing work accordingly; evaluating performance and providing feedback.
Interpersonal Skills	Teamwork	Working cooperatively with others to reach a common goal.
	Coaching	Helping others learn new skills.
	Leadership	Communicating ideas to justify position; accepting responsibility for others; and encouraging, persuading, convincing, or otherwise motivating an individual or group.
	Negotiation	Resolving conflict between two or more individuals through discussion and compromise.
	Customer service	Working and communicating with customers to satisfy their expectations.
	Cultural diversity	Working well with men and women and with a variety of ethnic, social, or educational backgrounds.
Information	Acquisition and evaluation	Identifying need for data, obtaining it from existing sources or creating it, and evaluating its relevance and accuracy.
	Organization and storage	Organizing, processing, and maintaining written or computerized records and other forms of information in a systematic way.
	Interpretation	Selecting and analyzing information and communicating the results to others.
	Processing	Using computers to acquire, organize, analyze, and communicate information.
Systems	Interrelationships	Knowing how social, organizational, and technological systems work and operate effectively.
	Monitoring	Distinguishing trends, predicting impact of actions on system operations, diagnosing deviations in systems' performance, and correcting malfunctions.
	Modification and design	Making suggestions to modify existing systems to improve products or services, and developing new or alternative systems.
Technology	Selection	Choosing procedures, tools, or equipment including computers and related technologies.
	Application	Demonstrating proper procedures for setting up and operating equipment.
	Maintenance and troubleshooting	Preventing, identifying, or solving problems with equipment, including computers and other technologies.

Related Academic and Workplace Skills
For *Diesel Technology: Safety Skills*

Task	Skill Group	Sub Skill	Description
Unit 1: General Safety			
Subscribe to a safety pledge. (A.S. 1)	Basic Skills	Reading	Reads and follows written directions; applies information to job performance
	Personal Management Skills	Responsibility	Sets high standards for self; accepts responsibility for self
		Organizational Effectiveness	Agrees to follow organization's basic safety rules
Apply general safety principles to the school and workplace. (A.S. 2)	Basic Skills	Reading	Analyzes and applies what has been read to a specific task; comprehends written information for main ideas
		Writing	Presents answers in a clear and understandable form; applies rules of grammar, spelling, and punctuation
	Thinking Skills	Problem Solving	Recognizes problems; gives possible solutions
		Creative Thinking	Presents new ideas for preventing accidents
	Personal Management Skills	Responsibility	Identifies consequences of unsafe acts
		Organizational Effectiveness	Identifies safety procedures required in the workplace; understands importance of safety to the organization
Determine correct fire extinguishers to use for various situations. (A.S. 3)	Basic Skills	Reading	Analyzes and applies what has been read to a specific task; comprehends written information for main ideas
	Thinking Skills	Problem Solving	Evaluates situations and gives possible solutions
		Seeing Things in the Mind's Eye	Organizes and processes symbols and objects
	Personal Management Skills	Organizational Effectiveness	Identifies safety equipment appropriate for given workplace situations; understands importance of safety to the organization
Operate a fire extinguisher. (J.S. 1)	Basic Skills	Reading	Reads and follows written directions; applies information to job performance
	Thinking Skills	Seeing Things in the Mind's Eye	Imagines the flow of work activities from narrative descriptions
	Personal Management Skills	Responsibility	Sets high standards for self in completion of a task; pays attention to details

Task	Skill Group	Sub Skill	Description
Unit 1: (continued)			
		Organizational Effectiveness	Identifies safety procedures required in the workplace; understands importance of safety to the organization
	Technology	Application	Sets up and operates fire extinguisher correctly
Lift a heavy object properly (J.S. 2)	Basic Skills	Reading	Reads and follows written directions; applies information to job performance
		Science	Applies principles of good body mechanics when performing task
	Personal Management Skills	Responsibility	Sets high standards for self in completion of a task; pays attention to details
		Organizational Effectiveness	Identifies safety procedures required in the workplace; understands importance of safety to the organization
Unit 2: Workplace Safety			
Interpret material safety data sheets. (A.S. 1)	Basic Skills	Reading	Identifies relevant details, facts, and specifications; analyzes and applies what has been read to specific task; understands technical words; determines what information is needed; follows written directions
		Writing	Applies rules of spelling; uses technical words; presents answers in a clear and understandable form
	Thinking Skills	Problem Solving	Draws conclusions from what is read and gives possible solutions
		Knowing How to Learn	Uses available resources to acquire information
	Personal Management Skills	Responsibility	Pays close attention to details; maintains concentration in completion of a task
		Organizational Effectiveness	Understands the importance of MSDS and safe use of chemicals to the organization
	Information	Acquisition	Acquires information from existing resources (MSDS)
Compile a list of hazardous materials found in your shop and provide additional information on the most common materials. (A.S. 2)	Basic Skills	Reading	Identifies relevant details; follows written directions
		Writing	Applies rules of spelling; uses technical words; presents answers in a clear and understandable form

Task	Skill Group	Sub Skill	Description
Unit 2: (continued)			
	Thinking Skills	Knowing How to Learn	Uses available resources to acquire information
		Reasoning	Draws logical conclusions from available information
	Personal Management Skills	Organizational Effectiveness	Understands the importance of MSDS and personal protective equipment in this industry
Apply the safety color codes to diesel technology shops. (A.S. 3)	Basic Skills	Reading	Follows written directions; applies information to new situations
	Thinking Skills	Creative Thinking	Uses imagination to create new shop drawing
		Decision Making	Evaluations information to make best decision
		Seeing Things in the Mind's Eye	Visualizes actual school shop and transfers images to drawing layout format
		Reasoning	Applies color coding system to shop objects
	Personal Management Skills	Organizational Effectiveness	Understands the organization's modes of operation; understands the importance of color coding to the industry
	Resources	Material and Facilities	Uses safety color codes and symbols in shop area
Identify workplace safety violations. (A.S. 4)	Basic Skills	Reading	Follows written directions; determines what information is needed
	Thinking Skills	Problem solving	Recognizes problems
		Reasoning	Applies safety rules to new situations
Complete an individual student shop safety inspection. (A.S. 5)	Basic Skills	Reading	Follows written directions; uses written information and applies it to a task
	Thinking Skills	Decision Making	Evaluates situations; makes recommendations for improvements
		Reasoning	Applies safety rules to situations; draws conclusions
	Personal Management Skills	Responsibility	Sets high standards for self; pays close attention to details
		Integrity/Honesty/ Work Ethic	Chooses ethical course of action; describes desirable working conditions; follows established rules, regulations, and policies
		Organizational Effectiveness	Understands the importance of a safe shop in industry; promotes the goals and values of the organization

Task	Skill Group	Sub Skill	Description
Unit 3: First Aid			
Determine basic first aid measures for given emergency situations. (A.S. 1)	Basic Skills	Reading	Follows written directions; identifies relevant details; applies information to new situations
		Writing	Presents answers in a clear and understandable format
	Thinking Skills	Decision Making	Generates options; considers risks; evaluates information to make best decision
		Problem Solving	Recognizes problems; gives possible solutions
		Reasoning	Draws conclusions; applies rules of first aid to new situations
	Personal Management Skills	Responsibility	Pays close attention to details
		Integrity/Honesty/ Work Ethic	Chooses ethical course of action; follows established rules, regulations, and policies
		Organizational Effectiveness	Understands the importance of safety and first aid in industry

References

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General Safety
Unit 1

Unit Contents

Teacher Components

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   a. Instructional Plan 1
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Student Components

DT:SS

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General Safety
Unit 1

Suggested Activities

Instructional Plan

Preparation

1. Read the unit carefully and plan for instruction.
2. Review "Teaching Suggestions." Plan for classroom activities.
3. Plan for students with special needs.
4. Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources" and "Suggested Supplemental Resources" for more information.
5. Make transparencies from the transparency masters included in this unit.
6. Develop teaching plan. Adjust for different learning styles.
7. Review "Instructions for Evaluating Student Performance."
8. Make copies of the Unit Evaluation Form, one for each student.

Delivery and Application

9. Provide students with unit of instruction.
10. Discuss unit and specific objectives.
11. Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
12. Discuss the assignment sheets. Review criteria for evaluation of these activities.
13. Discuss and demonstrate the job sheets. Make sure all required tools, equipment, and supplies are available. Review criteria for evaluation of these activities.

Evaluation

14. Discuss the use of the Unit Evaluation Form with students. Discuss the rating scale that will be used for student evaluation.
15. Make copies of the written test. Add or modify test items as needed.
16. Give written test.

Suggested Activities

17. Compile assignment sheet ratings, job sheet ratings, and written test scores on the Unit Evaluation Forms. Include any additional assignments or supplemental activities that should be part of the unit evaluation.

18. Reteach and retest as required.

Teaching Suggestions

Note: Skill areas appearing in bold face type in the "Teaching Suggestions" refer to the academic and workplace skills identified by the American Society for Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

1. Discuss what it means to be a "safe" person. **(Listening and speaking skills)**

2. Have students make shop safety posters related to general safety or fire safety. **(Creative thinking skills)**

3. Discuss severe weather procedures to follow when at school and/or at the workplace site. Relate situations that may be appropriate to your area concerning weather or natural disasters. **(Listening and speaking skills)**

4. Role play a "bomb threat" situation. How much information can be obtained to report to the authorities? **(Listening and speaking skills, responsibility skills, information acquisition skills)**

5. Explain classroom fire drill procedures, including the evacuation routes and fire exits. Also discuss where to meet outside, how everyone will be accounted for, and what the "all-clear" signal will be. Then have students participate in a fire drill. **(Responsibility skills, organizational effectiveness skills)**

6. Arrange for the local fire department to demonstrate the use of fire extinguishers. Have them show several types if possible, and then show the type available in your classroom or shop. **(Listening skills, organizational effectiveness skills)**

7. Discuss fire hazards in the diesel shop. Relate to the class actual fires you have seen or been involved in. Discuss the after effects of the fire (legal, financial, and emotional). **(Listening skills, responsibility skills)**

8. Post emergency telephone numbers for your area next to the classroom and/or shop telephone.

Resources Used in Developing This Unit

1. *The ABC's of Fire Protection.* Belleville, NJ: Walter Kidde and Company.

2. *An Accident Prevention Program for School Shops and Laboratories.* Office of Education/U.S. Department of Health, Education, and Welfare.

3. Clark, Elton, et. al. *Diesel Fundamentals*. Stillwater, OK: MAVCC, 1988.

4. *Making Safety Work*. Chicago, IL: National Safety Council.

5. *Safety and Health*. San Francisco: Parlay International, 1988.

6. *Safety on the Job: Some Guidelines for Working Safely*. Stillwater, OK: CIMC/Oklahoma Department of Vocational and Technical Education, 1989.

Suggested Supplemental Resources

1. Videotapes

   a. *Basic Practices*, 13 minutes

   b. *Safety Meeting Series 1*, 20 minutes

      (1) *Lifting*

      (2) *Eye Protection*

      (3) *Hand Tool Safety*

   c. *Safety Meeting Series 2*, 23 minutes

      (1) *Wearing Safety Gear*

      (2) *Housekeeping Hazards*

      (3) *Hand Protection*

   d. *Safety Meeting Series 4*, 22 minutes

      (1) *Fire Prevention*

      (2) *Hazard Awareness*

   e. *Safety Meeting Series 5*, 21 minutes

      (1) *Slips, Trips, and Falls*

      (2) *Protect Your Hearing*

   f. *Safety Meeting Series 15*, 36 minutes

      (1) *Commitment to Safety*

      (2) *Disaster Preparedness*

g. *Avoiding Slips, Trips, and Falls*, 12 minutes

h. *Back Care and Safety*, 14 minutes

i. *Eye Care and Safety*, 15 minutes

j. *Hearing Conservation and Safety*, 13 minutes

k. *Respiratory Safety and Health*, 12 minutes

l. *Safety Attitudes and Actions*, 14 minutes

m. *Selection and Use of Personal Protective Equipment*, 16 minutes

n. *Back to Basics for Safe Lifting*, 21 minutes

o. *Fire Extinguishers—The First Responder*, 16 minutes

a - o are available from:

Coronet/MTI Film & Video
4350 Equity Drive
Columbus, OH 43228
800-321-3106, x920

p. *Minimizing Back Strain*, 24 minutes

q. *Hand Safety*, 18 minutes

r. *Hearing Safety*, 18 minutes

s. *Eye Safety*, 20 minutes

t. *Portabie Fire Extinguisher Safety*, 26 minutes

u. *Safety: The Big Picture*, 12 minutes

v. *Avoiding Slips and Falls*, 18 minutes

p - v are available from:

Tel-A-Train
309 North Market Street
P.O. Box 4752
Chattanooga, TN 37405
800-251-6018 or 615-266-0113

w. *R.I.P. Harry Speaks*, 20 minutes

x. *Your Guardian Angel*, 15 minutes

w and x are available from:

International Film Bureau, Inc.
332 S. Michigan Avenue
Chicago, IL 60604-4382
800-432-2241

2. OSHA Fact Sheets

a. *Job Safety and Health*, 93-01

b. *Eye Protection in the Workplace*, 93-03

c. *Protect Yourself with Personal Protective Equipment*, 92-08

d. *Back Injuries—Nation's Number One Workplace Safety Problem*, 93-09

e. *Responding to Workplace Emergencies*, 92-19

f. *Workplace Fire Safety*, 93-41

a - f are available from regional OSHA offices or write to:

Office of Administrative Services
200 Constitution Ave., NW, Rm. N3101
Washington, D.C. 20210

3. Safety signs and posters

National Safety Council
444 North Michigan Avenue
Chicago, IL 60611
800-621-7619 (toll free outside Illinois)

Instructions for Evaluating Student Performance

When the student is ready to perform a specific task, obtain a copy of the job sheet which may be found in either the teacher or student edition. Then observe the student performing the procedure.

Process evaluation—Place a mark in the box to the left of each designated checkpoint if the student has satisfactorily achieved the step(s) for each checkpoint area. If the student is unable to correctly complete the procedure, have the student review the materials and try again.

Suggested Activities

Product evaluation—Once the student has satisfactorily completed the procedure, rate the student product (outcome) using the criteria which have been provided as part of the job sheet. If the student's product is unacceptable, have the student review the materials and submit another product for evaluation.

Sample performance evaluation keys have been provided below. Many other keys are available. Select one rating (grading scale) which best fits your program needs.

Option A

4 - Skilled—Can perform job with no additional training.
3 - Moderately skilled—Has performed job during training program; limited additional training may be required.
2 - Limited skill—Has performed job during training program; additional training is required to develop skill.
1 - Unskilled—Is familiar with process, but is unable to perform job.

Option B

Yes—Can perform job with no additional training.

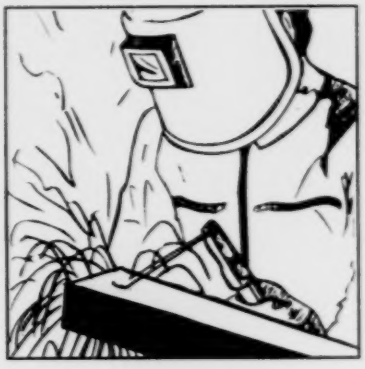
No—Is unable to perform job satisfactorily.

Personal Protective Equipment

Goggles

Safety Glasses
with Side Panels

Face Shield (used with
safety glasses or goggles)



Welding Helmet
with Filter Lenses

Eye Protection

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Personal Protective Equipment
(Continued)

Ear Plugs

Ear Muffs

Hearing Protection

Full-Brimmed
Hard Hat

Front-Brimmed
Hard Hat

Bump
Cap

Hair
Cover

Head Protection

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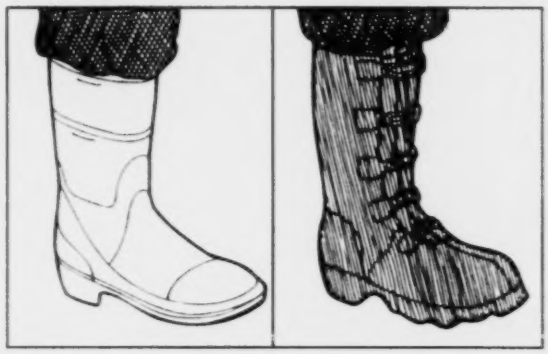
Personal Protective Equipment
(Continued)

Safety Shoes



Safety Boots

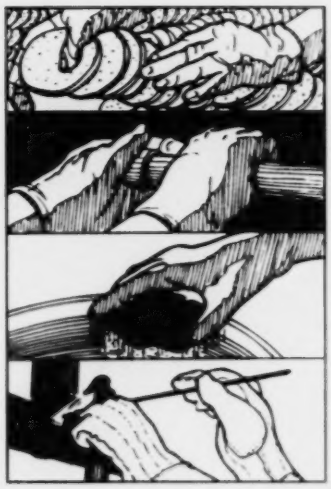
Foot Protection

Disposable Gloves

Fabric Gloves

Rubber Gloves

Leather Gloves



Hand Protection

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Personal Protective Equipment
(Continued)

Filtration Respirator

Purifying Respirator

Air-Supplying Respirator

Respiratory Protection

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How to Lift Safely

1.

Approach the load and size it up as to weight, size, and shape. Consider your physical ability to handle the load.

2.

Place feet close to the object to be lifted and 8 to 12 inches apart for good balance.

3.

Bend the knees to the degree that is comfortable and get a good handhold. Then using leg muscles . . .

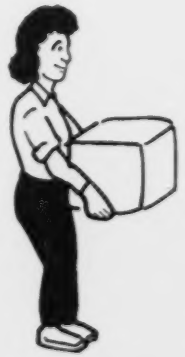
4.

Lift the load straight up smoothly and evenly. Push with your legs, and keep the load close to your body.

How to Lift Safely
(Continued)

5.

Lift the object into carrying position, making no turning or twisting movements until the lift is completed.



6.

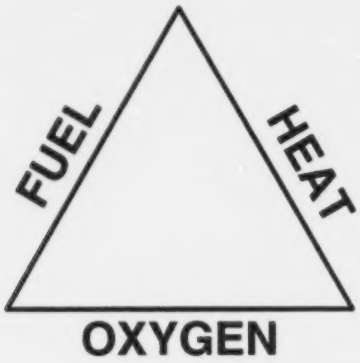
Turn your body with changes of foot position after looking over your path of travel, making sure it is clear.

7.

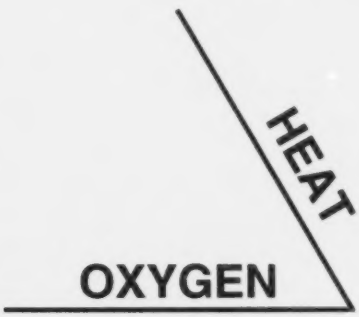
Setting the load down is just as important as picking it up. Using leg muscles, comfortably lower load by bending your knees. When load is securely positioned, release your grip.

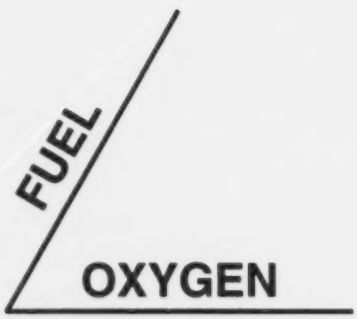
The Fire Triangle

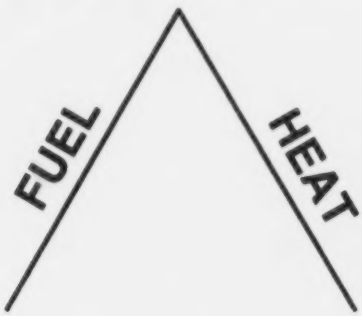
- To produce fire, three things must be present at the same time.



- If any one of the three is missing, a fire cannot be started.
- If any one of the three is removed from a fire, the fire will be extinguished.







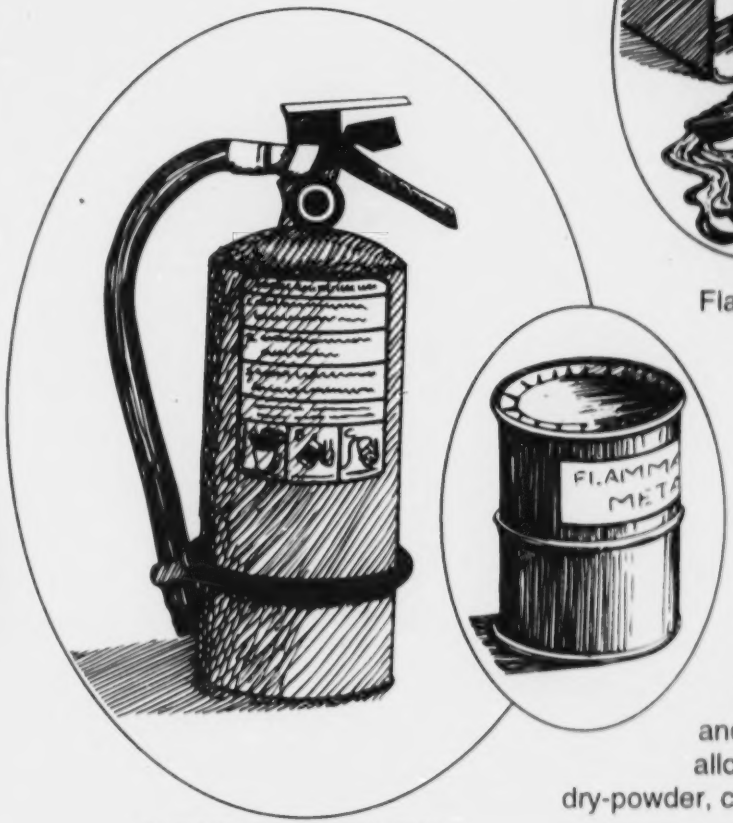
Classes of Fires

Be sure to use the right extinguisher for the type of fire you are confronting. Using the wrong extinguisher can actually make the fire worse.

Class A:
Wood, paper, cloth, rubbish

Class B:
Flammable gas/liquids

Class C:
Electrical fires



Class D:
Combustible metals such as magnesium, sodium, potassium, and sodium potassium alloys require a special dry-powder, class D extinguisher.

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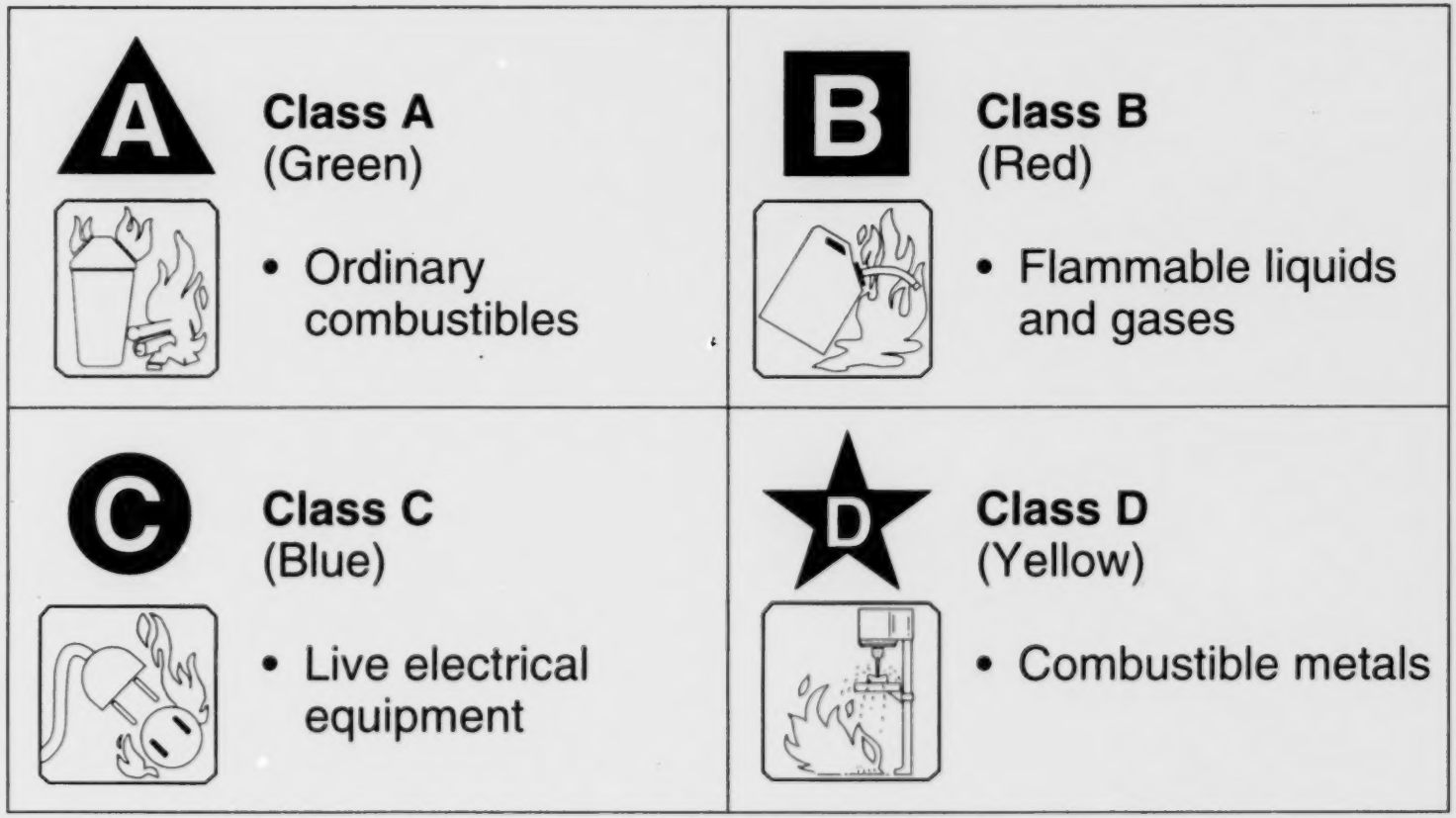
Types of Fire Extinquishers

Type of Fire	Approved Type of Extinguisher			
	Pressurized Water	Carbon Dioxide	Multi-Purpose Dry Chemical	Dry Powder
Class A Fires **ORDINARY COMBUSTIBLES** • Wood • Paper • Cloth, etc.				
Class B Fires **FLAMMABLE LIQUIDS, GREASE** • Gasoline • Paints • Oils, etc.				
Class C Fires **ELECTRICAL EQUIPMENT** • Motors • Switches, etc.				
Class D Fires **COMBUSTIBLE METALS** • Iron • Magnesium				

Fire Extinguisher Markings



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General Safety
Unit 1

Answers to Assignment Sheets

Assignment Sheets 1 - 2—Evaluate according to the criteria stated on each assignment sheet.

Assignment Sheet 3

a. 1, 2
b. 2, 3
c. 2, 3
d. 2, 3
e. 2
f. 2, 3
g. 1, 2
h. 2, 3
i. 2, 3
j. 2

General Safety
Unit 1

Written Test

Name _____ Date _____ Score _____

1. Match the terms on the right with the correct definitions.

_____a.	Source of danger	1. Accident
_____b.	To put out a fire; to cause to cease burning	2. Carelessness
_____c.	Exercise practiced so that all members can demonstrate what to do in case of an emergency	3. Combustible 4. Drill
_____d.	Freedom from danger, risk, or inury	5. Emergency
_____e.	Moving people out of a disaster or dangerous area into a safe place	6. Evacuation 7. Extinguish
_____f.	Any suddenly occurring, unintentional event - that causes injury or property damage	8. Flammable
_____g.	Devices used or worn to protect the physical health of an equipment operator or tool user	9. Hazard 10. Personal protective equipment
_____h.	Any accident or sudden illness that requires immediate intervention to prevent severe damage or death	11. Safety

2. Discuss at least three ways of developing a good safety attitude.

a. _____

_____

b. _____

_____

c. _____

_____

3. List six expectations for a safe environment at school or work.

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

   f. _____

4. List four basic types of emergencies.

   a. _____

   b. _____

   c. _____

   d. _____

5. Discuss at least three severe weather guidelines.

   a. _____

   _____

   b. _____

   _____

   c. _____

   _____

6. Arrange in order the steps to follow in case of a bomb threat by placing the correct sequence numbers (1-5) in the appropriate blanks.

   _____a. When you answer the call, obtain as much information as possible from and about the caller. Record the call if possible.

   _____b. Alert your instructor, supervisor, or building administrator immediately.

   _____c. A building search will be conducted by police/bomb squad.

   _____d. An "All Clear" signal will be given when it is safe to return to the building.

   _____e. Begin building evacuation immediately.

7. Describe how to conduct a fire evacuation.

   a. Upon discovery of a large fire or smoke or activation of a smoke detector, you should:

      (1) _____

      (2) _____

      (3) _____

   b. Evacuate building as soon as alarm sounds in the following manner:

      (1) _____

      (2) _____

      (3) _____

8. Identify the following personal protective equipment.

a. _____ b. _____

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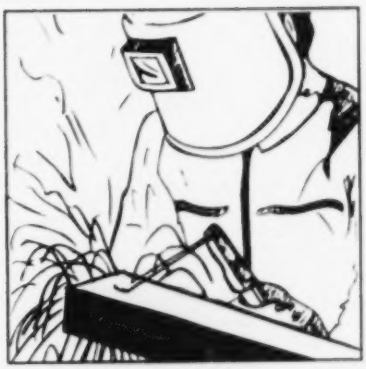
Written Test

c. _____



d. _____

e. _____

f. _____

g. _____

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9. Distinguish between correct and incorrect personal safety guidelines by circling "Do" or "Don't" as appropriate.

   a. (Do, Don't) wear personal protective equipment as required.

   b. (Do, Don't) ignore safety rules and posted signs.

   c. (Do, Don't) follow instructions when performing a task.

   d. (Do, Don't) operate, adjust, or repair equipment without permission and proper training.

   e. (Do, Don't) report defective tools and equipment immediately.

   f. (Do, Don't) report all accidents and get first aid immediately.

   g. (Do, Don't) correct or report all unsafe conditions immediately.

   h. (Do, Don't) keep mentally alert to shop hazards.

   i. (Do, Don't) conduct yourself in a manner conducive to safe shop practices.

   j. (Do, Don't) "horse around" on the job.

10. Complete the following guidelines for maintaining a safe work area by filling in the blanks with one of the following words:

approved metal containers	clean	ease of cleaning
immediately available	materials and supplies	obstacles and slippery substances
organized	traffic areas	

   a. Arrange equipment and vehicles to allow safe working practices and _____ _____

   b. Store _____ safely in their proper places.

   c. Keep work area _____ and clear of debris and other hazards.

   d. Keep floors clear of _____.

   e. _____ up spills immediately.

   f. Keep electrical cords and extension cords out of _____.

   g. Store oily, greasy, and paint-soaked rags in _____.

   h. Know where first aid and fire fighting equipment are kept so they are _____ in case of an emergency.

11. Match causes of back injuries with their contributing factors.

_____a. Injury usually results from overestimating your physical abilities and trying to lift more weight than you can handle.

_____b. Injury usually results from moving an object that may be within your weight capacity, but is too long, high, or wide to lift safely.

_____c. Injury usually results from moving an object that may be within your weight capacity, but has a cylindrical or other odd shape that makes lifting difficult.

_____d. Injury usually results from stacking materials so high that vision is limited and obstructions in the pathways cannot be seen.

_____e. Injury usually results from twisting or turning to an awkward position when lifting.

_____f. Injury usually results from using chairs or boxes to stand on instead of safely using a ladder, or by positioning object too far from work.

1. Improper position
2. Improper reaching
3. Improper storage
4. Obstructions
5. Shape
6. Size
7. Weight

12. Complete the following guidelines for lifting and moving items safely by selecting the correct answers. Write the correct numbers in the blanks.

Before lifting

_____a. Inspect the item to be lifted for _____, and grease or other slippery surfaces.

1. wrapping, handholds
2. jagged edges, splinters
3. size, weight
4. obstacles, wrapping

_____b. Wear _____ for protection, and make sure that they fit correctly.

1. steel-toed shoes
2. safety goggles
3. ankle supports
4. gloves

_____c. Clear any _____ from your path.

1. obstacles
2. customers
3. employees
4. floor coverings

_____d. Assess the _____ of the load

1. area
2. circumference
3. square footage
4. weight

_____e. _____ to lift heavy loads.

1. Use your back
2. Get help
3. Call a professional
4. Use a pry bar

Lifting

_____f. Place your _____ as close to the load as possible.

1. head
2. shoulders
3. hip
4. feet

_____g. Bend your knees, keeping your _____ straight and your chin tucked in.

1. leg muscles
2. arms and shoulders
3. back and neck
4. feet

_____h. Draw your _____ in close to your body.

1. arms
2. knees
3. feet
4. buttocks

_____i. Stand slowly and lift smoothly, using your _____.

1. legs
2. shoulders
3. back
4. knees

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Carrying

_____j. Hold the item _____.

1. at least 1 foot from waist
2. at knee level
3. at shoulder level
4. close to your body

_____k. Do not allow the load to _____.

1. touch your chest
2. rest on your shoulder
3. block your vision
4. shift toward your body

Setting the load down

_____l. Bend your _____.

1. arms
2. knees
3. back
4. head

13. List the three components of a fire.

a. _____

b. _____

c. _____

14. Match the classes of fires on the right with their correct fuel sources.

_____a. Fires that occur in or near electrical equipment (wiring, appliances)

_____b. Fires that occur with ordinary combustible materials (wood, paper, trash)

_____c. Fires that occur with flammable liquids (gas, oil, paints)

_____d. Fires from combustible metals (magnesium)

1. Class A
2. Class B
3. Class C
4. Class D

15. Distinguish among the types of fire extinguishers by completing the following descriptions.

    a. Carbon dioxide fire extinguishers may be used on Class _____ fires.

    b. Carbon dioxide fire extinguishers may **not** be used on Class _____ fires.

    c. Pressurized water fire extinguishers may **only** be used on Class _____ fires.

    d. _____ fire extinguishers may be used on Class A, B, and C fires.

16. Identify the following fire extinguisher markings by stating which class of fire it corresponds to.

a. _____ b. _____ c. _____ d. _____

(Yellow star) (Green triangle) (Blue circle) (Red square)

e. _____ f. _____ g. _____ h. _____

17. Arrange in order the steps in using a fire extinguisher by placing the correct sequence numbers (1-5) in the appropriate blanks.

    _____a. Aim the extinguisher nozzle at the base of the fire.

    _____b. Sweep from side to side until the fire appears to be out. Watch the fire area.

    _____c. Pull the pin. Some extinguishers require releasing a lock latch, pressing a puncture lever, or other step.

    _____d. Identify the class of fire (A-D) and then make sure your fire extinguisher is coded to put out that type of fire. Check the label on the fire extinguisher.

    _____e. Squeeze the handle. This releases the extinguishing agent.

18. Discuss at least seven ways to prevent fires.

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

***Permission to duplicate this test is granted.**

General Safety
Unit 1

Answers to Written Test

1.

a.	9	d.	11	g.	10
b.	7	e.	6	h.	5
c.	4	f.	1		

2. Discussion should include at least three of the following points (in the student's own words):

   a. **Focus on the present task.** Stay alert. If you're tired or bored, accidents can happen.
   b. **Take time to do the job right.** Staying safe may take a little extra time, but it will result in fewer mistakes. Determine what needs to be done first so you won't run out of time on high priority tasks.
   c. **Use your head.** Do what you know is right. Don't take shortcuts or fool around. Also don't let emotions like anger or frustration get in the way of doing a good job.
   d. **Take responsibility for your actions.** Others trust and depend on you to do your job correctly. If you do not act responsibly, others may suffer. Understand that safety is everyone's responsibility.
   e. **Avoid unnecessary risks.** Think of what could happen if you take a chance on an unsafe task. Many risks are dangerous and are not worth the chances.

3. Any six of the following:

   a. Lighting is adequate to perform required duties and to prevent eyestrain.
   b. Air is clean, without harmful fumes.
   c. Alarms are located to notify everyone in case of emergencies.
   d. Emergency exits are clearly marked, unlocked, and accessible.
   e. Emergency telephone numbers are posted.
   f. Fire extinguishers are readily available.
   g. First aid supplies are available.
   h. Walkways are clear, barrier-free, and accessible to all.
   i. Safety rules are posted.
   j. Evacuation routes are posted.
   k. All students/employees receive safety training.
   l. Personal protective equipment is available for all.
   m. No smoking/smoking areas are designated.
   n. Adequate storage areas are provided for hazardous materials.
   o. Hazardous materials are clearly identified.

4. Any four of the following:

   a. Fires
   b. Bombs and bomb threats
   c. Severe weather and natural disasters—Tornados, hurricanes, earthquakes, floods, etc.
   d. Accidents—Falls, cuts, burns, electrical shocks, poisonings, etc.
   e. Health problems—Heart attacks, strokes, seizures, heat exhaustion, etc.

Answers to Written Test

5. Discussions should include at least three of the following guidelines (in student's own words):

   a. When alarms (sirens) or warnings are issued by the local civil defense or national weather center, begin procedure to take cover.
   b. Move quickly and quietly to shelter area on the lowest level and in the interior of the building away from glass and outside openings.
   c. Sit down and protect yourself by putting your head as close to your lap as possible, or kneel down and cover your face and head with your arms.
   d. Answer to roll call if at school.
   e. Remain in designated area until the signal is given to return.

6. a. 1
   b. 2
   c. 4
   d. 5
   e. 3

7. a. (1) Pull the nearest fire alarm.
   (2) Close the doors around the fire to contain it.
   (3) Notify the building administrator or telephone operator (0 or 911) of the fire and its exact location.

   b. Any three of the following:

   (1) Remain calm and move quickly to exits. Do not use the elevators.
   (2) Close windows and doors as you leave your area. This limits the amount of oxygen the fire receives and prevents the spread of smoke.
   (3) Feel closed doors before opening them. Doors that are hot indicate a fire on the other side.
   (4) If you are unable to exit through the door and you must wait for rescue through windows, place wet cloths on the floor next to the door to prevent the spread of smoke into the room. A wet towel over the head will help if you must walk through smoke to an exit. DO NOT ENTER THICK SMOKE.
   (5) Once at the designated area, remain calm and stay with your group. All persons must be accounted for.

8. a. Respirator (purifying)
   b. Safety shoe (steel reinforced)
   c. Safety glasses (with side panels)
   d. Welding helmet (with filter lenses)
   e. Ear muffs
   f. Hard hat (front-brimmed)
   g. Gloves (rubber shown)

9. a. Do
   b. Don't
   c. Do
   d. Don't
   e. Do
   f. Do
   g. Do
   h. Do
   i. Do
   j. Don't

10.
a. Ease of cleaning
b. Materials and supplies
c. Organized
d. Obstacles and slippery substances
e. Clean
f. Traffic areas
g. Approved metal containers
h. Immediately available

11.

a.	7	d.	4
b.	6	e.	1
c.	5	f.	2

12.

a.	2	e.	2	i.	1
b.	4	f.	4	j.	4
c.	1	g.	3	k.	3
d.	4	h.	1	l.	2

13. (Any order)

a. Fuel
b. Heat
c. Oxygen

14.
a. 3
b. 1
c. 2
d. 4

15.
a. B or C
b. A or D
c. A
d. Multipurpose (dry chemical)

16.
a. Class C
b. Class D
c. Class B
d. Class A
e. Class D
f. Class A
g. Class C
h. Class B

17.
a. 3
b. 5
c. 2
d. 1
e. 4

Answers to Written Test

18. Discussion should include at least seven of the following guidelines (in student's own words):

a. Keep equipment clean and in good operating condition.
b. Never overload electrical circuits.
c. Store flammable/combustible materials in appropriate containers away from heat sources.
d. Keep work and trash areas clean and free of debris.
e. Dispose of flammables according to established safety guidelines.
f. Never leave open flames unattended.
g. Use caution when operating spark-producing equipment.
h. Clean up spills (if appropriate) or report.
i. Report suspicious persons (possible arsonists) to security or supervisory personnel.
j. Keep fire exits/escape routes clear and well-marked.
k. Know where fire alarm boxes are located.
l. Know where fire extinguishers are located.
m. Always be on the lookout for fires or conditions that could cause a fire and report them immediately.
n. Properly dispose of cigarettes and matches.
o. Always obey "no smoking" signs and areas.

General Safety
Unit 1

Unit Evaluation Form

Student Name _____ Unit Rating _____

Assignment Sheet 1—Subscribe to a Safety Pledge Rating _____

Comments: _____

_____

Assignment Sheet 2—Apply General Safety Principles to the School and Workplace Rating _____

Comments: _____

_____

Assignment Sheet 3—Determine Correct Fire Extinguishers to Use for Various Situtations Rating _____

Comments: _____

_____

Job Sheet 1—Operate a Fire Extinguisher Rating _____

Comments: _____

_____

Job Sheet 2—List a Heavy Object Properly Rating _____

Comments: _____

_____

Written Test Scores

Pretest _____ Posttest _____ Other _____

Other _____

_____

Teacher Signature _____ Date _____

Student Signature _____ Date _____

*Permission to duplicate this form is granted.

Workplace Safety
Unit 2

Unit Contents

Teacher Components

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DT:SS

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Workplace Safety
Unit 2

Suggested Activities

Instructional Plan

Preparation

1. Read the unit carefully and plan for instruction.
2. Review "Teaching Suggestions." Plan for classroom activities.
3. Plan for students with special needs.
4. Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources" and "Suggested Supplemental Resources" for more information.
5. Make transparencies from the transparency masters included in this unit.
6. Develop teaching plan. Adjust for different learning styles.
7. Make copies of the Unit Evaluation Form, one for each student.

Delivery and Application

8. Provide students with unit of instruction.
9. Discuss unit and specific objectives.
10. Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
11. Discuss the student supplement.
12. Discuss the assignment sheets. Review criteria for evaluation of these activities.

Evaluation

13. Discuss the use of the Unit Evaluation Form with students. Discuss the rating scale that will be used for student evaluation.
14. Make copies of the written test. Add or modify test items as needed.
15. Give written test.
16. Compile assignment sheet ratings and written test scores on the Unit Evaluation Forms. Add any additional assignments or supplemental activities that should be part of the unit evaluation.
17. Reteach and retest as required.

Suggested Activities

Teaching Suggestions

Note: The skill areas appearing in boldface type in the teaching suggestions refer tot he academic and workplace skills identified in *What Work Requires of Schools: A Report for America 2000* and *Workplace Basics: The Skills Employers Want*. These have been adapted by MAVCC.

1. Discuss the role of the federal government in workplace safety and environmental safety. Discuss how OSHA, EPA, DOT, and other federal agencies work to ensure a basic level of safety across the country. Also discuss the role of your state government as it relates to workplace safety. Have students discuss the pros and cons of government involvement in enforcing workplace safety. **(Listening and speaking basic skills, thinking skills, personal management skills)**

2. Display safety rules and safety posters as they apply to the diesel technology workplace. The OSHA "Job Safety and Health Protection" poster should also be displayed. **(Personal management skills)**

3. Show examples of chemical labels in your shop. Point out the different types of information found on a chemical label. (Objective 5) You could develop quizzes over the labels available in the diesel shop. **(Reading and science basic skills)**

4. Show examples of actual material safety data sheets. Point out different types of arrangements. (Objective 6) Three examples are given in Student Supplement 1. Let students know where these MSDSs will be kept in the shop. They should be readily accessible to all students. **(Personal management skills)**

5. Assist students in compiling a list of the hazardous materials in your shop and in deciding which are the most commonly used hazardous materials for Assignment Sheet 2. **(Personal management skills)**

6. Discuss accidents you have seen or been involved in with hazardous materials. Discuss the long term and short term effects. Discuss what should be done in case of an accident or spill. This will vary depending on the type of material. Have students refer to the MSDS for more information on accidents and spills. **(Thinking skills, personal management skills)**

7. While students are looking at labels and MSDS, have them note the diamond classification system if it is used. (Objective 10) Have them identify the hazardous levels of materials based solely on the diamonds. Then have them read the labels or MSDS for more information that confirms the diamond numbers (0-4). **(Information skills)**

8. Discuss how hazardous waste materials are stored, handled, and disposed of in your shop. Point out the storage and disposal containers. **(Materials and facilities resource skills)**

9. Show examples of the safety tags that are used in your shop. Review how these are to be used.

10. Show the brake and clutch cleaning equipment used in your shop. Review how this is to be used. **(Technology application skills)**

Suggested Activities

11. Demonstrate the proper use of the lifting equipment used in your shop. Also show equipment and vehicle stands and jacks. Review safety precautions. **(Technology application skills)**

12. You may also want to demonstrate the exhaust removal equipment used in your shop at this time. **(Technology application skills)**

13. Assignment Sheet 5 could be used as a group activity. You could conduct the tour of the shop, and students could complete the inspection during the tour. **(Thinking skills, personal management skills, interpersonal skills)**

Resources Used in Developing This Unit

1. Clark, Elton, et. al. *Diesel Fundamentals*. Stillwater, OK: MAVCC, 1988.

2. *Hazardous Waste Management for the Small Quantity Generator*. Stillwater, OK: CIMC/Oklahoma Department of Vocational and Technical Education, 1989.

3. *Hazardous Waste Regulations Pertaining to the Disposal of Waste from Clayton Brake Washers Using the CareFree Disposal System*™. Lakewood, NJ: Clayton Associates, Inc., 1994.

4. Landberg, Lynn, senior editor. "Getting Your Clean-Air Act Together." *Tech Tips* (May 1994). Equipment Maintenance Council.

5. Norman, Andrew and Robert Scharff. *Heavy-Duty Truck Systems*. New York: Delmar Publishers, Inc., 1991.

6. *OSHA Compliance Encyclopedia*. 3 volumes. Madison, CT: Business and Legal Reports, Inc., 1994.

7. *Safety and Health*. San Francisco: Parlay International, 1988.

8. *Safety on the Job: Some Guidelines for Working Safely*. Stillwater, OK: CIMC/Oklahoma Department of Vocational and Technical Education, 1989.

9. Warzecha, Mary. *Hazardous Materials Fingertip Retrieval System*. Alexandria, VA: American Vocational Association, 1988.

Suggested Supplemental Resources

1. *Hazard Communication Handbook*. Coastal Video Communications Corp.

2. Videotapes

   a. *Hazard Communication: The Road to Safety*

   b. *Hazard Communication: A Healthy Responsibility*

   c. *Learn From Their Mistakes: HazCom Case Histories*

d. *MSDS: Read It Before You Need It*

e. *Asbestos Awareness*

f. *Avoiding Electrical Hazards*

1 and 2a - f are available from:

Coastal Video Communications Corp.
3083 Brickhouse Court
Virginia Beach, VA 23452-9942
800-767-7703

g. *Safety Meeting Series 8*, includes the following two videos:

(1) *Lockout/Tagout*
(2) *Safety Materials Handling*

h. *The Right to Know: Hazardous Substances in the Workplace*

2g and h are available from:

Coronet/MTI Film & Video
4350 Equity Drive
Columbus, OH 43228
800-321-3106, x920

i. *Your Right to Know*, 16 minutes

j. *Chemical Safety I: Proper Handling*, 20 minutes

k. *Handling and Transporting Hazardous Materials—General Awareness Training*, 18 min.

l. *MSDS: Communicating Chemical Safety*, 18 minutes

m. *Electrical Safety*, 27 minutes

n. *Electrical Lockout/Tagout* 24 minutes

o. *Asbestos: Understanding the Hazards*, 22 minutes

2i - o are available from:

Tel-e-Train
309 North Market Street
P.O. Box 4752
Chattanooga, TN 37405
800-251-6018 or 615-266-0113

p. *Hazard Communication: Learning the System*, 17-minute videotape. Workbooks and OSHA Compliance manual are also available.

q. *Understanding Chemical Labels*, 12-minute videotape.

r. *The MSDS and You*. 12-minute videotape. Workbooks are also available.

2p - r are available from:

International Film Bureau, Inc.
332 S. Michigan Avenue
Chicago, IL 60604-4382
800-432-2241

3. Brochure—*Refrigerant Recycling in Motor Vehicle Air Conditioners: Guide for Professionals*. United States Environmental Protection Agency, September 1992. For more information, contact:

MVACs Recycling Program Manager
Stratospheric Ozone Protection Branch (6202J)
U.S. E.P.A.
401 M Street, S.W.
Washington, D.C. 20460

4. OSHA Fact Sheets

a. 89-32 *Control of Hazardous Energy Sources (Lock-out/Tagout)*

b. 92-11 *Carbon Monoxide Poisoning*

c. 93-06 *Better Protection Against Asbestos in the Workplace*

d. 93-26 *Hazard Communication Standard*

e. 93-35 *OSHA: Employee Workplace Rights and Responsibilities*

Note: Contact your regional OSHA office or the national OSHA publications office for these and additional resources about safety issues affecting diesel technology students and workers. OSHA can provide publications, fact sheets, videos, posters, and federal registers of proposed and final rules.

U.S. Department of Labor
Occupational Safety and Health Administration (OSHA)
Regional Offices

Region I
(CT, MA, ME, NH, RI, VT)
133 Portland St., 1st Fl.
Boston, MA 02114

Region II
(NJ, NY, PR, VI)
201 Varick St., Rm. 670
New York, NY 10014

Region III
(DC, DE, MD, PA, VA, WV)
Gateway Building, Ste. 2100
3535 Market St.
Philadelphia, PA 19104

Region IV
(AL, FL, GA, KY, MS, NC, SC, TN)
1375 Peachtree St., N.E.
Ste. 587
Atlanta, Ga 30367

Region V
(IL, IN, MI, MN, OH, WI)
230 S. Dearborn St.
Rm. 3244
Chicago, IL 60604

Region VI
(AR, LA, NM, OK, TX)
525 Griffin St., Rm. 602
Dallas, TX 75202

Region VII
(IA, KS, MO, NE)
1100 Main St., Rm. 800
Kansas City, MO 64105

Region VIII
(CO, MT, ND, SD, UT, WY)
Federal Building, Rm. 1576
1961 Stout St.
Denver, CO 80294

Region IX
(American Samoa, AZ, CA, Guam, HI, NV, Trust Territories of the Pacific)
Attn: Publications
71 Stevenson St., Ste. 420
San Francisco, CA 94105

Region X
(AK, ID, OR, WA)
1111 Third Ave., Ste. 715
Seattle, WA 98101-3212

or

Office of Administrative Services
200 Constitution Ave., NW, Rm. N3101
Washington, DC 20210
202-219-4667

5. *Hazardous Materials Program—Mechanical Repair* or *Hazardous Materials Program—Body Shop*. Consists of manuals for both managers and employees, as well as wall charts, videotape on "Right to Know," and MSDS binder. Available from:

   KLM Automotive Publishing Inc.
   P.O. Box 26093
   San Diego, CA 92126
   800-447-4433 (or 619-549-6800 in CA)

6. *Hazardous Material "Right to Know" Training Program*—Kit consists of one teacher guide and five student manuals, wall chart, MSDS file box, videotape, inventory poster, and chemical fact sheets. Available from:

   Motor Publications
   5600 Crooks Road
   Troy, MI 48098
   800-426-6867

7. Interactive CD ROM software programs

   a. *Avoiding Slips, Trips, and Falls*

   b. *Back Care and Safety*

   c. *Basic First Aid*

d. *Fire Prevention and Safety*

e. *Hearing Conservation and Safety*

f. *Lock-out/Tag-out*

g. *Right-to-Know*

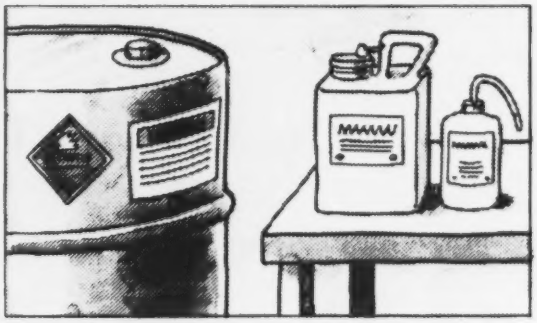
h. *Safety Attitudes and Actions*

i. *Selection and Use of Personal Protective Equipment*

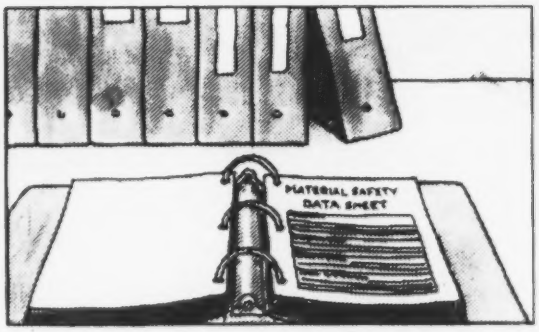
7a - i are available from:

TPC Training Systems
750 E. Lake Cook Road, Suite 250
Buffalo Grove, IL 60089-9913

OSHA's HazCom Standard



Warning labels on containers



Material Safety Data Sheets (MSDS) readily available to employees

Employee training on the proper handling, usage, storage, and transportation of chemicals

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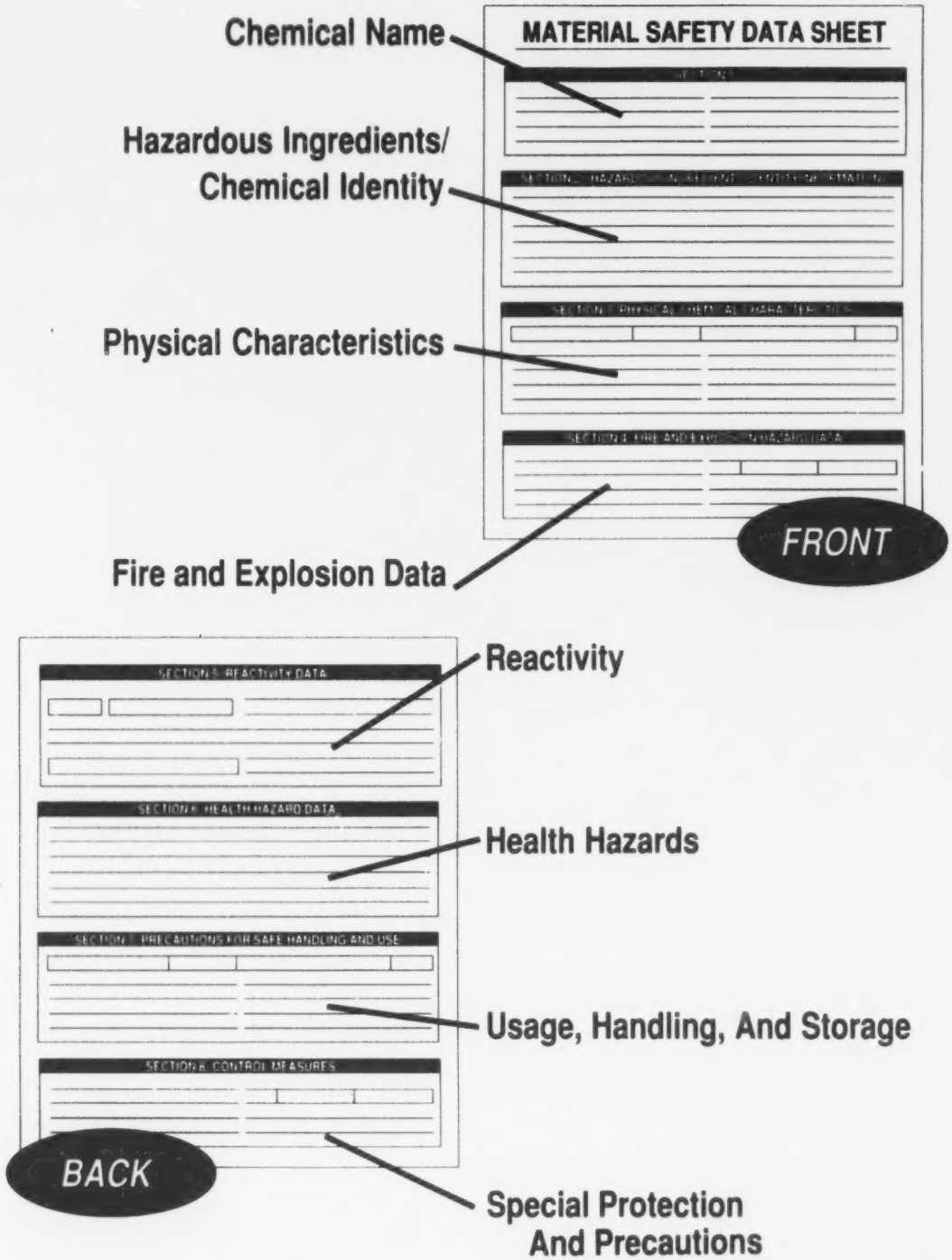
TM 1

MSDS Example



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TM 2

Characteristics of a Hazardous Material

If the MSDS or chemical label lists any of these characteristics, then the material is considered hazardous.

Capable of being easily ignited and burning quickly at temperatures below 100°F; can explode

Capable of dissolving metals and/or burning skin and eyes

Capable of burning, exploding, or giving off harmful vapors if mixed with air, water, heat, or other materials

Capable of causing illness or death after exposure, even at very low levels

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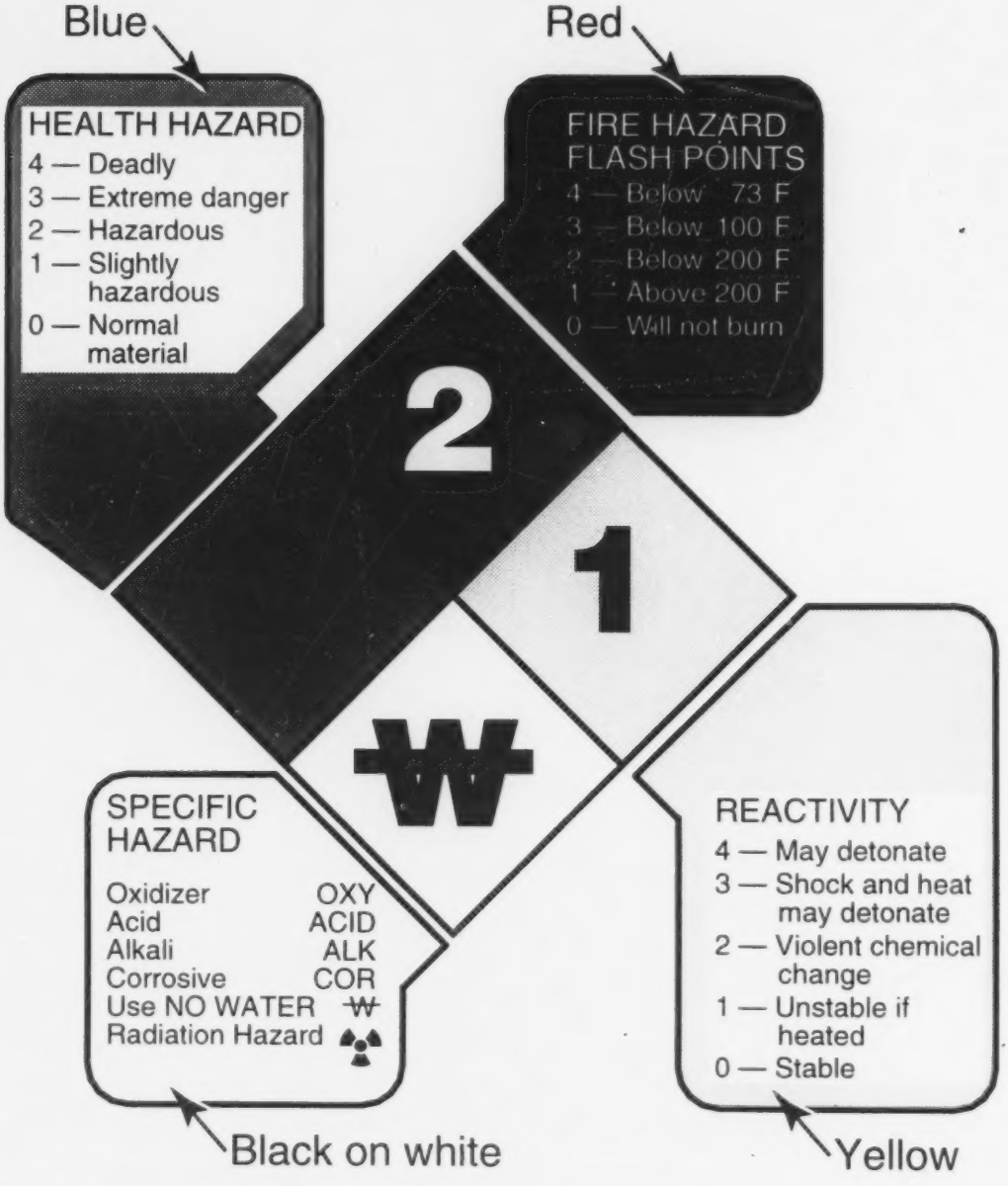
Hazardous Materials Diamond Classification System (NFPA)



Workplace Safety
Unit 2

Answers to Assignment Sheets

Assignment Sheet 1—Evaluate according to the criteria stated on the assignment sheet. Content of each item in the exercise may be evaluated using the following suggestions as guidelines.

MSDS 1—Duracell Alkaline Battery

1. Potassium hydroxide, manganese dioxide, zinc, mercury
2. Batteries may release toxic mercury vapors when battery-can integrity is broken.
3. Immediately flush skin with water. For eye contact, flush with copious amounts of water for 15 minutes and see physician at once.
4. Do not incinerate since battery may explode.
5. When handling leaking batteries, use neoprene, rubber, or latex nitrile gloves. Store at room temperature and in a dry place.
6. Install according to equipment instructions. Do not recharge or dispose of in fire. Replace all batteries in equipment at the same time. Do not mix battery systems of different types, such as alkaline and zinc-carbon batteries. Do not carry batteries loose in your pocket or carrying bag. Check batteries periodically when in use.

MSDS 2—Mobil Lubricating Oil

1. None
2. Refined mineral oils
3. Slight skin irritation
4. a. Eye contact—Flush with water
   b. Skin contact—Wash contact areas with soap and water
   c. Inhalation—None
   d. Ingestion—Not a problem, but if uncomfortable, seek medical assistance
5. Strong oxidizers
6. Carbon dioxide, foam, dry chemical, water fog
7. Firefighters must use self-contained breathing apparatus.
8. Absorb on fire-retardant-treated sawdust, diatomaceous earth, etc. Shovel up and dispose of at an appropriate waste-disposal facility in accordance with current applicable laws and regulations and with product characteristics at time of disposal.

MSDS 3—Gel Graffiti

1. An engine degreaser
2. Ethanol, aromatic hydrocarbon, chlorinated hydrocarbon, glycol ethers
3. Opaque white gel
4. 77
5. Carbon dioxide (CO_2) and foam
6. Container may rupture
7. 50 ppm
8. Yes. Chlorinated hydrocarbon has produced cancer in animal studies. (NTP Program)
9. Inhalation
10. Headaches, dizziness, irritation, burning eyes, nausea, asphyxia, and possible chemical pneumonitis if aspirated into lungs

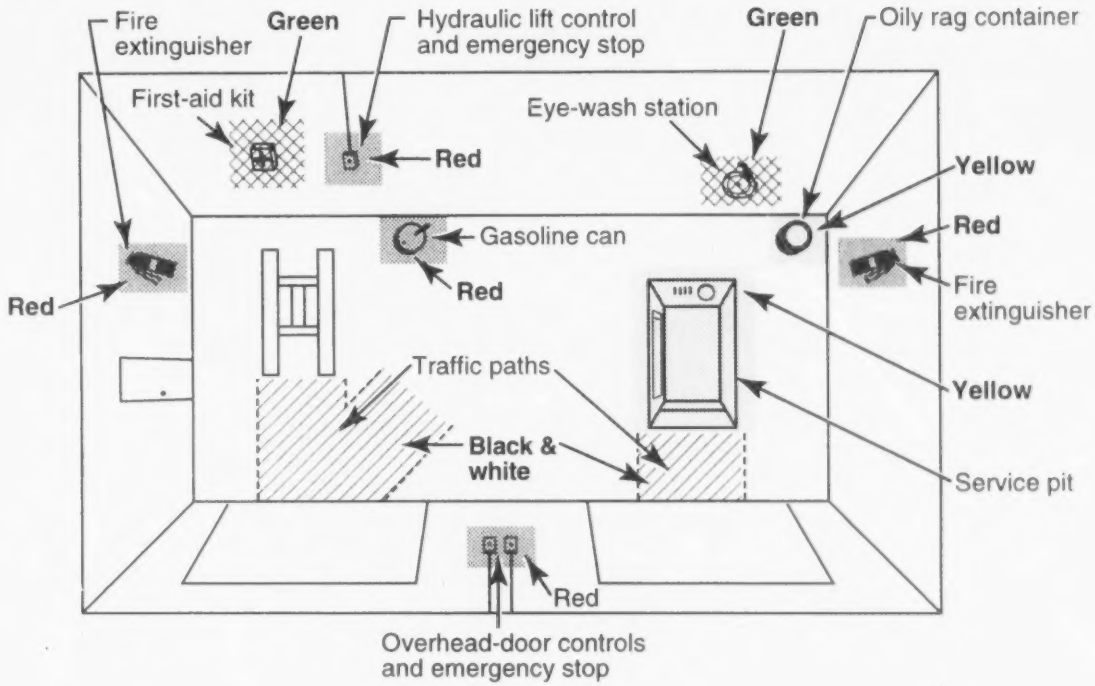
Answers to Assignment Sheets

11. The victim should **NOT** be induced to vomit.
12. Heat, sparks, welding arc, open flames
13. Strong oxidizing agents
14. Absorb with suitable medium. Incinerate or landfill according to local, state, or federal regulations. Do not flush to sewer.
15. Safety glasses, neoprene gloves, and adequate ventilation or respirator if concentration exceeds TLV
16. Wash with soap and water before handling food.

Assignment Sheet 2—Evaluate according to the criteria listed on the assignment sheet and as appropriate for your school shop.

Assignment Sheet 3

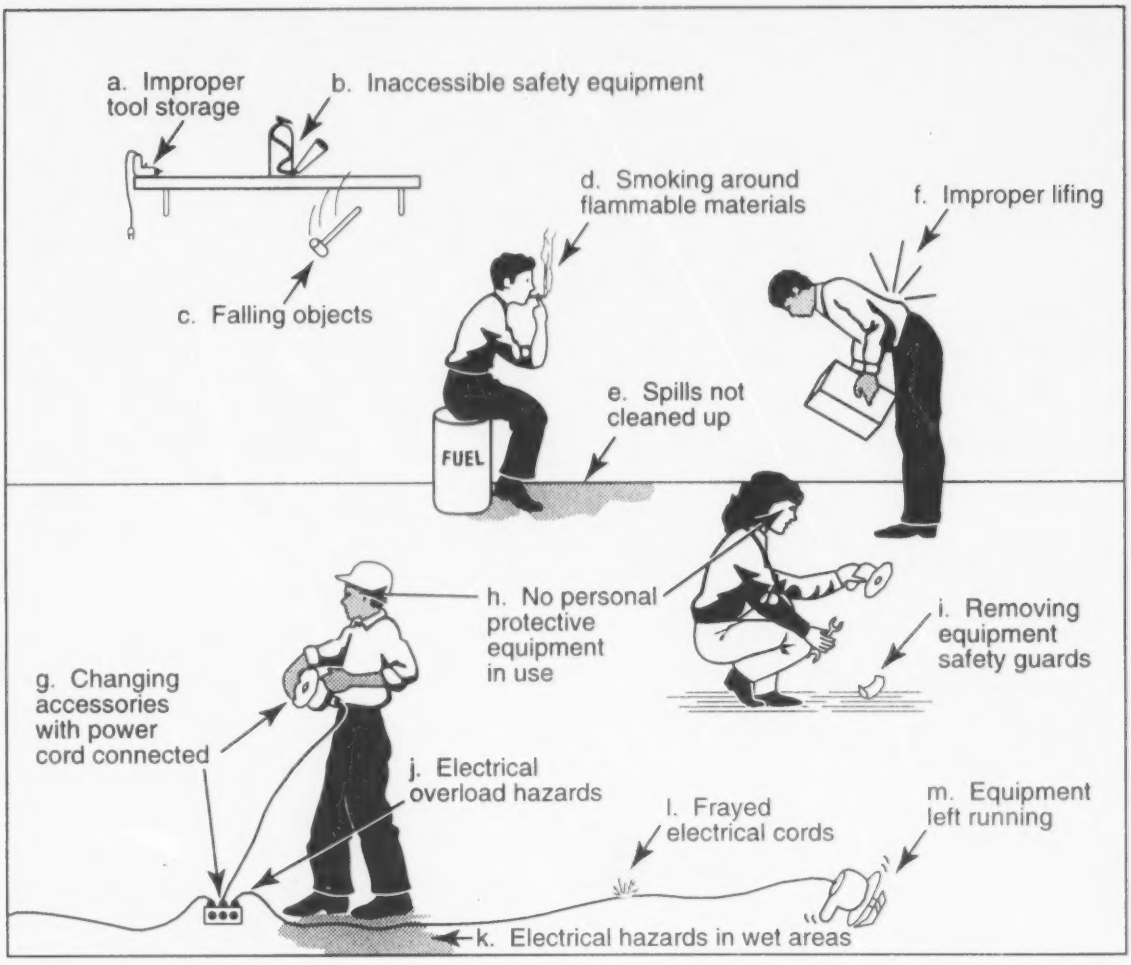
Part A: Given Shop



Part B: School shop—Evaluate according to the criteria listed on the assignment sheet and as appropriate for your school shop.

Answers to Assignment Sheets

Assignment Sheet 4—At least eight of the following:


a. Improper tool storage
b. Inaccessible safety equipment
c. Falling objects
d. Smoking around flammable materials
e. Spills not cleaned up
FUEL
f. Improper lifing
g. Changing accessories with power cord connected
h. No personal protective equipment in use
i. Removing equipment safety guards
j. Electrical overload hazards
k. Electrical hazards in wet areas
l. Frayed electrical cords
m. Equipment left running

Assignment Sheet 5—Evaluate according to the criteria listed on the assignment sheet and as appropriate for your school shop.

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Workplace Safety
Unit 2

Written Test

Name _____ Date _____ Score _____

1. Match the terms on the right with the correct definitions.

_____a. Temperature at which a substance will catch fire

_____b. Unwanted by-products that are ignitable, corrosive, reactive, or toxic

_____c. Electrical connection to an object that conducts electrical current to the earth

_____d. Form that explains a hazardous material that an employee works with so the employee can safely use the material and respond to emergency situations

_____e. Colorless, odorless, poisonous gas formed by incomplete combustion

_____f. Material that does not allow the transmission of electricity

_____g. Chemical that dissolves another substance

_____h. Capable of bursting into flames at temperatures above 100°F

_____i. Any substance that could cause injury or death to a person or damage to the environment

_____j. Capable of causing illness or death after exposure, even at very low levels

_____k. Readily vaporized at a relatively low temperature

_____l. Capable of burning, exploding, or giving off harmful vapors if mixed with air, water, heat, or other materials

1. Carbon monoxide
2. Combustible
3. Conductor
4. Corrosive/caustic
5. Electricity
6. Environmental Protection Agency (EPA)
7. Exposure
8. Exposure limit
9. Flammable
10. Flash point
11. Grounded
12. Hazardous material
13. Hazardous waste
14. Insulator
15. Material safety data sheet (MSDS)
16. Occupational Safety and Health Act (OSHA)
17. Reactive
18. Solvent
19. Toxic
20. Volatile

2. Distinguish among the federal agencies that regulate hazardous materials and hazardous waste by placing the following letters next to the correct descriptions:

   - DOT
   - EPA
   - OSHA

   _____a. Regulates the disposal of hazardous waste

   _____b. Regulates the transportation of hazardous materials

   _____c. Regulates hazards in the workplace, including worker exposure to hazardous materials

3. Complete statements concerning OSHA's role in workplace health and safety by circling the correct answers.

   a. The Occupational Safety and Health Act was signed on December 29, (1950) (1970).

   b. The U.S. Department of (Education) (Labor) created the Occupational Safety and Health Administration (OSHA) to oversee the Act.

   c. OSHA (does) (does not) issue standards and rules for safe and healthful working conditions, tools, equipment, facilities, and processes.

   d. OSHA (does) (does not) conduct workplace inspections to assure that standards are followed.

   e. OSHA sets two major requirements for employers—to provide work and a workplace free from recognized hazards, and to comply with (OSHA regulations) (IRS guidelines).

4. Complete statements concerning hazard communication by filling in the blanks with the correct answers.

   a. OSHA established the Hazard Communication Standard to protect the health and safety of _____.

   b. This standard sates that employees have both a need and a "_____ _____ _____" the hazards and the identities of the chemicals they are exposed to when working.

   c. Employees also need to know what _____ _____ are available to prevent adverse effects from occurring.

d. OSHA requires employers to develop a written HazCom program including:

(1) Warning labels on containers

(2) _____

(3) Employee training on the proper handling, usage, storage, and transportation of chemicals

5. Describe at least four types of information on a chemical label.

a. _____

_____

b. _____

_____

c. _____

_____

d. _____

_____

6. Match information on a material safety data sheet (MSDS) on the right with the correct descriptions.

_____a. Describes usual or safe physical qualities such as how it looks or smells, boiling and melting temperatures, evaporation rates, how easily it dissolves, and how heavy it is (compared to water)

_____b. Includes names of substances in the chemical that might be dangerous, safe exposure limits, and common names for the chemical

_____c. Lists the identity of the substance, the date the MSDS was prepared, name and address of the manufacturer, and usually a phone number for emergencies

_____d. Describes how to clean up an accidental spill, leak, or release, including special precautions. Tells how to handle, store, and dispose of chemical safely.

1. Chemical name
2. Fire and explosion data
3. Hazardous ingredients/ chemical identity
4. Health hazards
5. Physical characteristics
6. Reactivity
7. Special protection and precautions
8. Usage, handling, and storage

_____e. Lists ways the chemical might enter your body, symptoms of overexposure, and emergency first aid procedures

_____f. Explains special personal protective equipment and other equipment to use when working with the chemical and extra health and safety information not covered in other sections

_____g. Describes what happens if this chemical comes in contact with certain conditions or chemicals

_____h. Identifies flash point, flammability, combustibility, and the best way to put out a fire involving that chemical

7. List the four characteristics of a hazardous material.

   a. _____

   b. _____

   c. _____

   d. _____

8. List three ways hazardous materials can enter the body.

   a. _____

   b. _____

   c. _____

9. Distinguish between the short-term and long-term health effects from exposure to hazardous materials by placing an "S" or "L" next to the correct descriptions and examples.

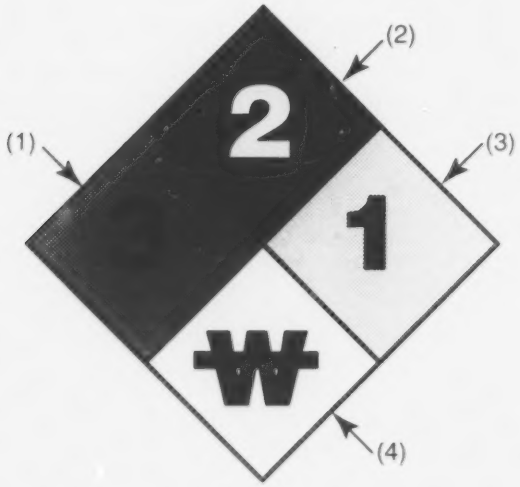
   _____a. Examples include pain, nausea, itching skin, burning eyes, headache, and vomiting

   _____b. Examples include cancer, asbestosis, emphysema, sterility, and kidney damage

   _____c. Severe, ongoing illness resulting from repeated or prolonged encounters with a chemical

   _____d. Minor symptoms resulting from a brief encounter with a chemical

10. Identify hazards using the hazardous material diamond classification system.



a. What color is the #1 diamond and what hazard does it represent?
_____, _____

b. What color is the #2 diamond and what hazard does it represent?
_____, _____

c. What color is the #3 diamond and what hazard does it represent?
_____, _____

d. For the #4 diamond, what color would the letters or symbols be? _____

e. What does a rating of 4 mean? _____

f. What does a fire rating of 0 mean? _____

g. What does the symbol W mean? _____

h. What does the abbreviation OXY mean? _____

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11. Complete the following chart of hazardous materials that may be found in the diesel technology shop listing at least one name, use, or danger as appropriate.

Hazardous Material	Common Uses	Dangers
Asbestos	a.	b.
Benzene	Used in many solvents and in some motor fuels	c.
Carbon monoxide, nitrous oxide, and other exhaust fumes	Unwanted waste products of internal combustion engines	d.
Ether, ethyl, and its compounds	e.	Avoid all contact and inhalation. Can damage skin, eyes, lungs, and nervous system.
f.	Used as fuels, solvents, thinners, additives, sealants, and lubricants	Avoid contact and inhalation. Can damage skin, eyes, and nervous sytem. Also use extreme care because all are a fire hazard.
Lead	g.	May be formed into metal dust when cutting or grinding on products made of this toxic heavy metal. Avoid breathing this dust. Can cause severe damage to the nervous system.
Sulfuric acid	h.	Avoid contact and inhalation. Can damage skin, eyes, lungs, and nervous system.

12. Select from the following list the hazardous waste products associated with the diesel technology shop by placing an "X" in the appropriate blanks.

    _____a. Contaminated food

    _____b. Contaminated fuel

    _____c. Contaminated water

    _____d. Waste antifreeze

    _____e. Waste caustic/corrosive

    _____f. Waste medical products

    _____g. Waste oil

    _____h. Waste pesticides

    _____i. Waste solvent

13. Complete statements concerning guidelines for storing and disposing of hazardous materials by filling in the blanks with the correct answers.

    a. Store and dispose of hazardous materials according to the _____ and your school/company policies.

    b. Store flammable/combustible materials separate from _____.

    c. Store hazardous materials in _____ cabinets.

    d. Never pour hazardous materials into/onto _____.

    e. The _____ monitors hazardous waste disposal to make sure that several environmental laws passed by Congress are followed properly.

    f. Most hazardous waste products are sent to _____ for disposal. Waste water must be pretreated and then sent to a municipal sewer system.

    g. The EPA has established guidelines to comply with the Clean Air Act for the recovery and recycling of motor vehicle _____. EPA-approved equipment must be used by trained and certified technicians.

14. Distinguish between true and false statements concerning guidelines for using flammable materials and toxic substances. Place "T" or "F" as appropriate.

    _____a. If your hair or clothing catches fire, run to the nearest exit or report to your supervisor.

    _____b. Carefully read and follow container label directions before using any flammable liquids or toxic substances. Refer to the MSDS for more detailed information.

    _____c. Wear personal protective equipment (PPE) as specified on the MSDS to prevent eye and skin contact.

    _____d. Use flammable and toxic chemicals in tightly closed areas without fresh air sources.

    _____e. Avoid breathing toxic fumes or gases.

    _____f. Use a water type fire extinguisher on all flammable and toxic chemical fires.

    _____g. Smoking and welding is allowed around corrosives and reactives, but not flammables.

15. Complete statements concerning equipment and tool safety guidelines by circling the correct answers.

    a. Always wear (eye) (respiratory) protection while grinding and drilling.

    b. Remove (clothes) (jewelry) when operating power equipment.

    c. Secure (long) (short) hair and loose clothing such as ties, scarves, or wide sleeves when working around power equipment.

    d. Obey all safety rules and operating instructions provided by the equipment manufacturer, plus any additional ones used by your (mother) (shop).

    e. Keep tools and equipment (oily) (clean) and in safe working order.

    f. Properly store tools and equipment when (in use) (not in use).

    g. (Keep) (Remove) guards and safety devices on all equipment.

    h. (Tag) (Discard) and report to the supervisor/instructor any defective tools, machines, or equipment.

    i. (Turn off) (Unplug) power equipment when not in use.

    j. Operate equipment (before) (after) receiving training on how to use it properly and safely.

    k. (Never) (Always) use compressed air to clean yourself or your clothing.

    l. Practice this tool motto: "Get, use, and (put) (throw) away."

16. Complete statements concerning electrical safety guidelines by filling in the blanks with the correct answers.

    a. Do not use any electrical appliance or equipment while you are touching _____.

    b. Before performing a maintenance task on electrical equipment, disconnect the power and _____ machine tools (if trained).

    c. Keep electrical equipment and work areas _____ to prevent electrical fires. Electrical sparks could ignite any flammable material nearby.

    d. Keep access to electrical panels and junction boxes _____.

    e. Keep flammable materials away from _____.

    f. Know the location of fuses and _____.

    g. Plug power tools into grounded outlets installed with _____.

    h. Never use _____ on electrical fires.

    i. Name at least one unsafe electrical condition or item that should be reported to your instructor or supervisor immediately. _____

    _____

17. Match the colors of the federal safety color code with their correct uses.

_____a.	Indicates caution; physical hazards; waste containers for explosive or combustible materials; equipment that should not be started, used, or moved; and starting point or power source for machinery	1. Black and white
_____b.	Identifies fire protection equipment; portable containers of flammable liquids; and emergency stop bars, stop buttons, and electrical stop switches on machinery	2. Blue
_____c.	Identifies first aid equipment	3. Green
_____d.	Identifies dangerous parts of equipment that could cut, crush, shock, or otherwise injure; indicates safety starter buttons	4. Orange
_____e.	Indicates traffic flow paths, storage areas, and housekeeping areas	5. Purple
_____f.	Indicates radiation hazards	6. Red
		7. Yellow

Written Test

18. Match the types of safety tags with their correct color coding.

_____a.	White tag, white letters on red square	1. Caution tag
_____b.	White tag, white letters on red oval, on black square	2. Danger tag
_____c.	Yellow tag, yellow letters on black square	3. Do not start tag
_____d.	White tag, white letters on black square	4. Out of order tag

19. Complete statements concerning general safety guidelines for working on vehicles by circling the correct answers.

a. Be sure vehicle is (in gear) (out of gear) before starting it.

b. Use extreme caution when moving a vehicle in the shop. Check around the vehicle and the planned path to make sure there are no (obstacles) (fires) in the way.

c. Use a (rear-view mirror) (spotter) to help you if trying to maneuver or park a vehicle in a close area.

d. (Do) (Do not) leave a vehicle running in the shop without adequate exhaust-removal equipment in place.

e. Avoid moving parts on the vehicle, such as (fans) (frame).

f. Avoid parts that heat up during engine operation, such as (tires) (exhaust pipes).

g. (Do) (Do not) allow tools or other metal objects to contact both battery terminals at the same time.

h. Wear (gloves) (hearing protection) when handling batteries.

i. Wear your (safety glasses) (safety belt) whenever you ride in or drive a vehicle, including test drives—no matter how short.

20. Complete statements concerning an overview of asbestos and guidelines for reducing asbestos exposure by filling in the blanks with the correct answers.

a. Asbestos is the name of a class of magnesium-silicate minerals that occur in _____ form.

b. Asbestos can cause disabling respiratory disease and various types of _____ if the fibers are inhaled. Symptoms of these diseases generally do not appear for 20 or more years after initial exposure.

c. Name at least one OSHA recommendation to reduce asbestos exposure to levels below the PEL. _____

_____

d. Name one of the two OSHA preferred methods for brake and clutch inspection, disassembly, repair, and assembly in the diesel technology shop. _____

_____

e. Every effort should be made in the shop to prevent asbestos fibers from becoming _____.

***Permission to duplicate this test is granted.**

Workplace Safety
Unit 2

Answers to Written Test

1.

a.	10	e.	1	i.	12
b.	13	f.	14	j.	19
c.	11	g.	18	k.	20
d.	15	h.	2	l.	17

2. a. EPA
   b. DOT
   c. OSHA

3. a. 1970
   b. Labor
   c. Does
   d. Does
   e. OSHA regulations

4. a. Employees (workers)
   b. Right to know
   c. Protective measures (students may give specific examples)
   d. Material Safety Data Sheets (MSDS) readily available to employees

5. Any four of the following:

   a. Chemical name and ingredients
   b. Name, address, and phone number of the manufacturer or distributor
   c. Procedures for usage, handling, storage, and disposal
   d. How to handle spills and leaks
   e. Signal words identifying chemical as hazardous

      (1) Caution—Least severe
      (2) Warning—Very severe
      (3) Danger—Most severe

   f. Critical first aid instructions and type of fire extinguisher to use
   g. Personal protective equipment to wear when using the chemical
   h. Other information about the chemical

      (1) Flammability
      (2) Radioactivity
      (3) Reactivity—Uses words "incompatible," "unstable," and "volatile"
      (4) Toxicity

6.

a.	5	e.	4		
b.	3	f.	7		
c.	1	g.	6		
d.	8	h.	2		

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Answers to Written Test

7. a. Flammable
   b. Corrosive
   c. Reactive
   d. Toxic

8. a. Ingestion—Swallowing by mouth
   b. Absorption—Contacting the skin or eyes
   c. Inhalation—Breathing in gases, vapors, fumes, or other airborne forms of a material

9. a. S
   b. L
   c. L
   d. S

10. a. Blue, health
    b. Red, fire
    c. Yellow, reactivity
    d. Black letters
    e. Severe hazard
    f. Will not burn
    g. Use no water
    h. Oxidizer

11. Students should list at least one name, use, or danger for each.

    a. Used as fireproofing insulation in clutch and brake linings and pads
    b. Do not inhale asbestos dust. Can cause serious long-term lung damage and disease.
    c. Avoid all contact and inhalation. Can damage skin, eyes, and nervous system.
    d. Avoid inhalation. Fumes interfere with body's use of oxygen. Can cause death by suffocation.
    e. Used in antifreeze, several solvents, starting fluids, and some fuel additives
    f. Flammable and combustible liquids, including all products containing petroleum or alcohol
    g. Used in pipes, cables, batteries, radiators, and solder
    h. Used in battery electrolyte

12. b, c, d, e, g, i

13. a. MSDS
    b. Corrosives or reactives
    c. Locked or metal
    d. Into the drain, sewer, or garbage can, or onto the ground
    e. Federal government or EPA
    f. Recyclers
    g. Air conditioning refrigerants

Answers to Written Test

14.
a.	F		e.	T
b.	T		f.	F
c.	T		g.	F
d.	F			

15.
a. Eye
b. Jewelry
c. Long
d. Shop
e. Clean
f. Not in use
g. Keep
h. Tag
i. Turn off
j. After
k. Never
l. Put

16.
a. Metal or water
b. Tag or lockout
c. Clean
d. Clear (unobstructed)
e. Heat or electrical heat sources
f. Circuit breakers
g. Ground fault circuit interrupters (GFCIs)
h. Water
i. Any one of the following:

(1) Defective, frayed, or damaged cords
(2) Shocking, sparking, overheating, or smoking equipment
(3) Corroded or broken switches or outlets
(4) Extension cords in permanent use

17.
a.	7		d.	4
b.	6		e.	1
c.	3		f.	5

18.
a. 3
b. 2
c. 1
d. 4

19.
a. Out of gear
b. Obstacles
c. Spotter
d. Do not
e. Fans
f. Exhaust pipes
g. Do not
h. Gloves
i. Safety belt

Answers to Written Test

20. a. Fibrous
    b. Cancers
    c. Any one of the following:

        (1) Engineering controls (including approved brake cleaning equipment)
        (2) Exposure monitoring
        (3) Respirators and protective clothing
        (4) Hygiene facilities (clean change rooms, lockers, and showers)
        (5) Warning signs and labeling
        (6) Recordkeeping and medical exams

    d. Either one of the following:

        (1) Negative pressure enclosure with HEPA (high efficiency particulate air) vacuum system
        (2) Low pressure/wet cleaning brake cleaning equipment

    e. Airborne

Workplace Safety
Unit 2

Unit Evaluation Form

Student Name _____ Unit Rating _____

Assignment Sheet 1—Interpret Material Safety Data Sheets Rating _____

Comments: _____

_____

Assignment Sheet 2—Compile a List of Hazardous Materials Found in Your Shop and Provide Additional Information on the Most Common Materials Rating _____

Comments: _____

_____

Assignment Sheet 3—Apply the Safety Color Code to Diesel Technology Shops Rating _____

Comments: _____

_____

Assignment Sheet 4—Identify Workplace Safety Violations Rating _____

Comments: _____

_____

Assignment Sheet 5—Complete An Individual Student Shop Safety Inspection Rating _____

Comments: _____

_____

Written Test Scores

Pretest _____ Posttest _____ Other _____

Unit Evaluation Form

Other: _____

_____

Teacher Signature _____ Date _____

Student Signature _____ Date _____

*Permission to duplicate this form is granted.

First Aid
Unit 3

Unit Contents

Teacher Components

1. Suggested Activities — Teacher Page

   a. Instructional Plan 1
   b. Teaching Suggestions 2
   c. Resources Used in Developing This Unit 3
   d. Suggested Supplemental Resources 3

2. Transparency Masters

   TM 1—Major Causes of Accidents 7
   TM 2—Basic First Aid Procedures 9
   TM 3—Basic First Aid Procedures (continued) 11
   TM 4—Basic First Aid Procedures (continued) 13

3. Answers to Assignment Sheet 1 15

4. Written Test 17

5. Answers to Written Test 25

6. Unit Evaluation Form 29

Student Components

DT:SS

1. Objective Sheet 87

2. Information Sheet 89

3. Assignment Sheet

   AS 1—Determine Basic First Aid Measures for Given Emergency Situations 111

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First Aid
Unit 3

Suggested Activities

Instructional Plan

Preparation

1. Read the unit carefully and plan for instruction.
2. Review "Teaching Suggestions." Plan for classroom activities.
3. Plan for students with special needs.
4. Obtain films, videotapes, and other resources to supplement instruction of this unit. See "Resources" and "Suggested Supplemental Resources" for more information.
5. Make transparencies from the transparency masters included in this unit.
6. Develop teaching plan. Adjust for different learning styles.
7. Make copies of the Unit Evaluation Form, one for each student.

Delivery and Application

8. Provide students with unit of instruction.
9. Discuss unit and specific objectives.
10. Discuss information sheet. Implement teaching plan to localize, supplement, and personalize the unit. Reinforce basic academic and workplace skills when applicable.
11. Discuss the assignment sheet. Review criteria for evaluation of this activity.

Evaluation

12. Discuss the use of the Unit Evaluation Form with students. Discuss the rating scale that will be used for student evaluation.
13. Make copies of the written test. Add or modify test items as needed.
14. Give written test.
15. Compile assignment sheet ratings and written test scores on the Unit Evaluation Forms. Add any additional assignments or supplemental activities that should be part of the unit evaluation.
16. Reteach and retest as required.

Suggested Activities

Teaching Suggestions

Note: Skill areas appearing in bold face type in the "Teaching Suggestions" refer to the academic and workplace skills identified by the American Society for Training and Development (ASTD) and the U.S. Department of Labor. These have been adapted by MAVCC.

1. You may wish to have a certified first aid instructor teach this unit. This unit is not meant to be a first aid course, but only a review of common accidents and basic first aid information. First aid techniques (bandaging, splinting, mouth-to-mouth, etc.) should be taught by a certified instructor.

2. Discuss accidents that have occurred in the diesel shop, and have students brainstorm on ways those accidents could have been prevented. **(Problem solving skills)**

3. Make sure emergency numbers are posted by the telephone for your classroom/shop area. Discuss whether or not 911 is used in your area.

4. Discuss which types of injuries require emergency help (refer to Objective 6), which injuries you can transport to the hospital or doctor's office, and which injuries only need basic first aid. You may wish to have students categorize the following list into these three categories: **(Decision making and problem solving skills)**

   - Heart attack
   - Stroke
   - Arm cut on gravel during a fall
   - Deep cut on leg (but victim is conscious)
   - Third-degree burn
   - Fainting, victim is now conscious
   - Minor (first-degree) burn
   - Broken arm
   - Asthma attack
   - Back injury, possibly broken during a fall
   - Back injury, possible strain from lifting improperly
   - Chemical explosion, several victims burned
   - Electrical accident (shock)
   - Bruise
   - Eye injury from metal particles flying from grinder (not wearing safety glasses)
   - Others?

5. Discuss the Good Samaritan laws in your state and how these impact on first aid practices.

6. Show the first aid box (kit) available in the classroom/shop. Compare its contents with Objective 9. Discuss which items are used the most.

7. Invite a member of your local emergency medical service team to speak to the class about precautions that rescuers should take to avoid contact with blood and body fluids that may be contaminated by HIV and hepatitis B. **(Listening skills)**

8. Have students role play how to give first aid for the various emergencies discussed in this unit (Objectives 11 - 14). Have students alternate between the roles of victim and rescuer. **Caution** students not to use actual breaths for mouth-to-mouth, breaths or chest compressions for CPR, or thrusts for Heimlich during the role playing, but they can show you when those steps would be appropriate in an actual emergency. **(Thinking skills, personal management skills, and interpersonal skills)**

9. Contact your local American Red Cross or local hospital for more information about CPR classes being offered. Encourage students to sign up, or you may want to have the class given at your school. Check with school officials for CPR options.

Resources Used in Developing This Unit

1. American Red Cross. *Community First Aid and Safety*. St. Louis: Mosby Lifeline, 1993.

2. American Red Cross. *First Aid: Responding to Emergencies*. St. Louis: Mosby Lifeline, 1991.

3. American Red Cross. *Standard First Aid and Personal Safety*, 2nd ed. Garden City, NY: Doubleday & Company, Inc., 1979.

4. Bowman, Kim. *You Can Give First Aid*. Syracuse, NY: New Readers Press, 1989.

5. Goodner, Brenda. *The OSHA Handbook: Interpretive Guidelines for the Bloodborne Pathogen Standard*. El Paso, TX: Skidmore-Roth Publishing, Inc., 1993.

6. National Safety Council. *First Aid and CPR*. Boston: Jones and Bartlett Publishers, Inc., 1991.

7. *Safety and Health*. San Francisco: Parlay International, 1988.

Suggested Supplemental Resources

1. *Preventing Bloodborne Disease*, 18-minute videotape that demonstrates how to apply Universal Precautions to prevent contamination and infection from bloodborne pathogens. Correct use of PPE is stressed.

2. *Recognizing Sudden Illness*, 14-minute videotape that discusses medical emergencies and what to do. Covers appendicitis, heart attack, diabetic emergency, stroke, fever, dizziness, fainting, and convulsions.

3. *An Ounce of Prevention*, 14-minute videotape that emphasizes ways to prevent accidents and injuries. Covers drowning, sunburn, anaphylactic shock, heat exhaustion, animal bites, poisonous plants, heat stroke, snake bites, insect bites and stings, and frostbite.

1 - 3 are available from:

Tel-A-Train
309 North Market Street
P.O. Box 4752
Chattanooga, TN 37405
800-251-6018 or 615-266-0113

Suggested Activities

4. *Annual First Aid Review*, 18-minute videotape that presents a refresher course on the signs and symptoms of injuries and sudden illness.

5. *Medical Emergencies in the Workplace: Those First Crucial Minutes*, 24-minute videotape that demonstrates how to handle electric shock, poisonous gases, chemicals in the eyes, choking, falls, deep cuts, and more.

6. R.E.A.C.T. Series (video modules)

   a. *Accident Prevention and Safety*, 13 minutes

   b. *Bandaging*, 11 minutes

   c. *Care for a Choking Victim Who is Unconscious*, 8 minutes

   d. *Emergency Action Principles*, 11 minutes

   e. *Emergency Rescue and Transfer*, 12 minutes

   f. *First Aid for Burns*, 11 minutes

   g. *First Aid for Injuries to Bones, Muscles, and Joints*, 10 minutes

   h. *First Aid for Specific Injuries*, 14 minutes

   i. *First Aid for Wounds*, 9 minutes

   j. *Mouth-to-Mouth Breathing*, 11 minutes

   4 - 6a-j are available from:

   Coronet/MTI Film & Video
   4350 Equity Drive
   Columbus, OH 43228
   800-321-3106

7. *Bloodborne Pathogens: Worker Awareness*, videotape and workbook. Covers awareness about what bloodborne pathogens are and how they are transmitted, as well as safe work practices to prevent infection. Available from:

   Summit Training Source, Inc.
   620 Three Mile Road NW
   Grand Rapids, MI 49504-8200
   800-842-0466

8. *Bloodborne Pathogens: Protection in Educational Environments*, 20 minutes.

9. *First Aid for Schools: Initial Response*, 19 minutes.

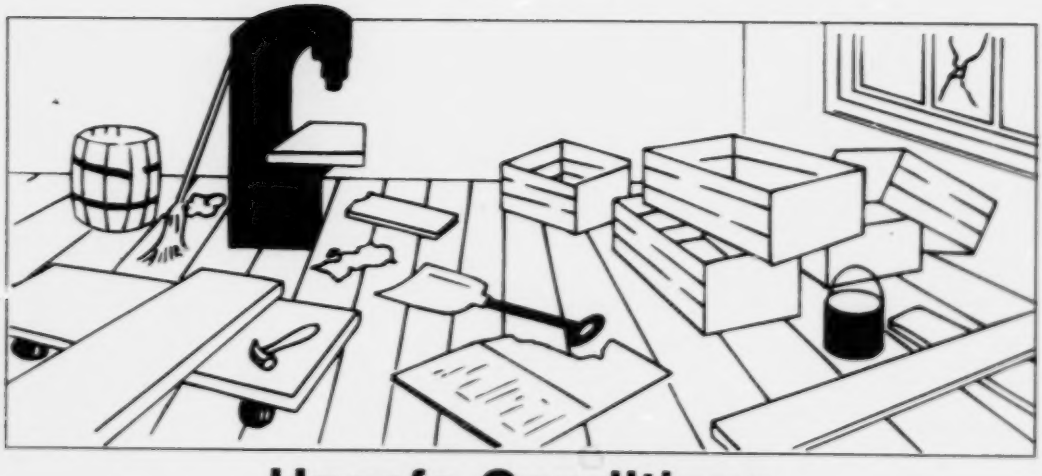
8 and 9 are available from:

Coastal Video Communications Corp.
3083 Brickhouse Court
Virginia Beach, VA 23452
800-767-7703 or 800-828-8190

Major Causes of Accidents

Unsafe Acts

Unsafe Personal Factor



Unsafe Conditions

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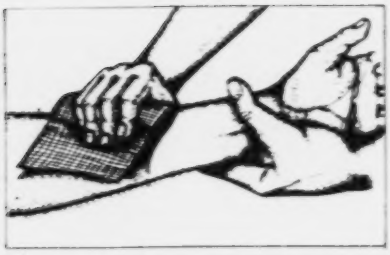
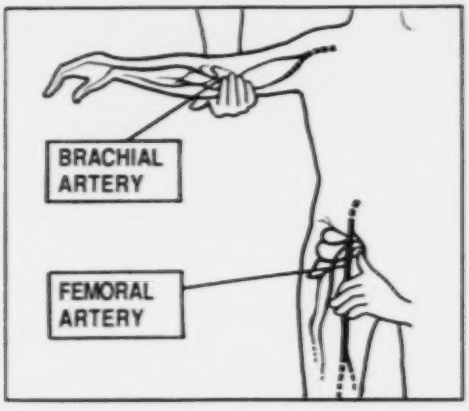
Basic First Aid Procedures



For bleeding, cover wound and apply pressure.



For severe bleeding, apply pressure to pressure points.

For fractures, immobilize with splints, slings, or wraps.

For spinal injuries, do not move victim. Call for help immediately.

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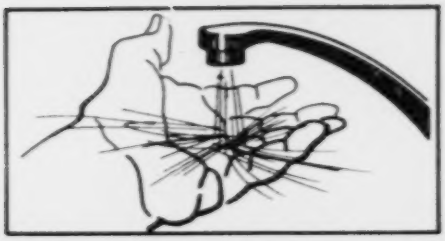
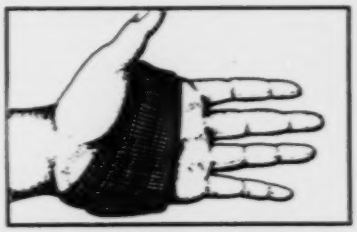
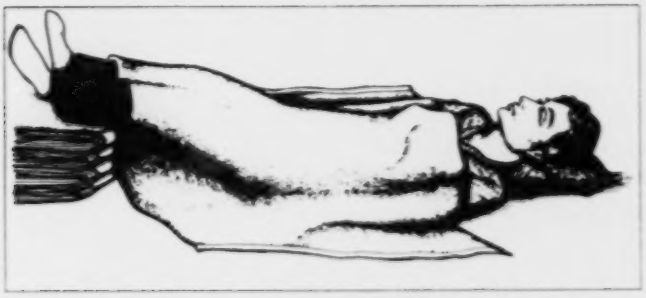
Basic First Aid Procedures
(Continued)

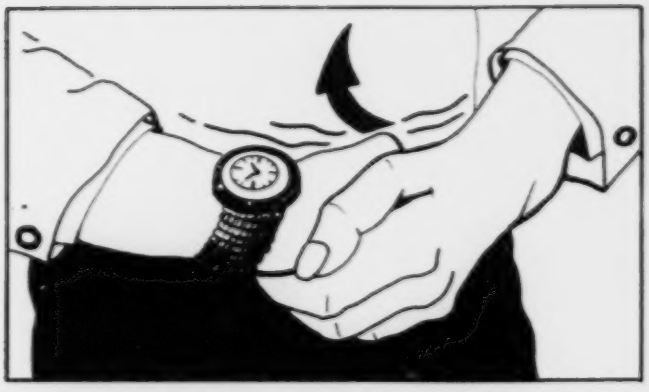




For minor burns, hold under cold water and apply dry, sterile dressing.



For shock, lay victim down, elevate legs, and cover.



For choking, apply abdominal thrusts (Heimlich maneuver).

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Basic First Aid Procedures
(Continued)

If person is not breathing, give mouth-to-mouth breathing if trained.

If person is not breathing and has no pulse, give CPR if trained. CPR consists of cycles of chest compressions and mouth-to-mouth breathing.

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First Aid
Unit 3

Answers to Assignment Sheet 1

1. Jane is probably suffering from heat stroke. Have someone call 911, and notify your supervisor. Move Jane to a cool location (outside or air-conditioned office). Cool her as quickly as possible. Remove her outer clothing and sponge bare skin with cool water or rubbing alcohol. Place cold packs at neck, armpits, head, and groin. Use fans for additional cooling.

2. Gary appears to have a third-degree burn. Have someone call 911, and notify your supervisor. Cool burned area with a damp compress (no ointment) and cover with dry, sterile dressing. Cover Gary with a blanket to prevent heat loss.

3. The customer appears to be suffering from shock as well as minor bleeding. Have someone call 911, and notify your supervisor. Treat for shock first—lay her down on her back or side if she starts vomiting. Elevate her legs, cover her to prevent heat loss, and loosen her clothing if necessary. Now treat the bleeding—Put on your disposable gloves, cover wound with dressing, and apply pressure until bleeding stops. Notify designated personnel to clean up any materials or surfaces contaminated by blood or body fluids.

4. Robert appears to be unconscious because of the electrical shock he received when electricity and water made a connection. Have someone call 911, and notify your supervisor. Turn off the electricity at the master power switch in the shop. Check Robert's breathing and pulse. Perform mouth-to-mouth breathing or CPR if necessary and if qualified. Watch for signs of traumatic shock, and treat as necessary. Check for signs of electrical burns at entrance wound and exit wound, and treat as necessary.

5. Your supervisor Susan has a severe cut and possible head injury. Have someone call 911, and notify any other supervisors in the building. Lay Susan flat. Check her breathing and pulse. Perform mouth-to-mouth breathing or CPR if necessary and if qualified. Now treat the bleeding—Put on your disposable gloves, cover wound with dressing, and apply pressure until bleeding stops. Watch for signs of shock, and treat as necessary. Notify designated personnel to clean up any materials or surfaces contaminated by blood or body fluids.

6. Ask Ted if he is choking. Administer the Heimlich maneuver by standing behind him, wrapping your arms around his middle, placing your fist on the area above his belly button, and applying quick, upward thrusts until the food is expelled. If this does not work immediately, have someone call 911 and your supervisor, but keep trying the thrusts.

7. Lisa's minor cut needs antiseptic ointment and a bandage. Try to convince her to let you help or go get the first aid supplies so Lisa can do it herself. If she still refuses help, notify your supervisor. Emergency 911 help is not necessary in this case.

8. Todd appears to have a serious eye injury. Have someone call 911, and notify your supervisor. Have Todd close both of his eyes and apply a sterile dressing and a loose bandage. Do not let him rub his eyes.

9. Angela appears to have a closed fracture of her left arm. Have someone call 911, and notify your supervisor. Immobilize Angela's arm with splints, sling, or wraps, or wait for help and let them immobilize it. Do not move Angela.

10. Your supervisor Steve appears to be having a heart attack. Have someone call 911, and notify any other supervisors in the building. Have Steve sit or lie down, whichever is more comfortable. Loosen his clothing around his neck and midriff. Check his breathing and pulse. Perform CPR if necessary and if qualified.

First Aid
Unit 3

Written Test

Name _____ Date _____ Score _____

1. Match the terms on the right with the correct definitions.

_____a.	Immediate care given to a victim of injury or sudden illness until more advanced care can be obtained	1. Accident
_____b.	Technique used to restore circulation and breathing for a victim whose breathing and heart have stopped; combines chest compressions and mouth-to-mouth breathing	2. Acquired immune deficiency syndrome
_____c.	Permission to provide care, given by the victim to the rescuer	3. Airway obstruction
_____d.	Suddenly occurring, unintentional event that causes injury or property damage	4. Anaphylactic shock
_____e.	Life-threatening bloodborne disease that depresses the immune system; caused by the human immunodeficiency virus; is eventually fatal	5. Antiseptic
_____f.	Blockage of the airway by food, fluids, or other foreign objects	6. Arteries
_____g.	Disease-causing microorganism found in infected blood and blood products	7. Bloodborne pathogen
_____h.	Blood vessels that carry oxygen-rich blood from the heart to all parts of the body	8. Cardiopulmonary resuscitation
_____i.	Major blood vessels that supply blood to the head and neck	9. Carotid arteries
_____j.	Condition in which the body does not produce enough insulin	10. Choking
_____k.	Severe and sometimes fatal reaction to a substance; characterized by respiratory distress, fainting, and itching	11. Consent
		12. Coronary arteries
		13. Diabetes
		14. Emergency medical service
		15. Epilepsy
		16. First aid
		17. Heimlich maneuver
		18. Hepatitis
		19. Injury

_____l. Wound or injury caused by violence or excessive physical force

_____m. Beat felt in arteries with each contraction of the heart

_____n. State in which a person experiences no sensory impressions

_____o. Procedure for forcing a foreign object from the airway of a choking victim

20. Medical emergency
21. Pressure points
22. Pulse
23. Trauma
24. Unconsciousness
25. Veins

2. List three examples for each of the major causes of accidents.

a. Unsafe acts

1) _____

2) _____

3) _____

b. Unsafe personal factors

1) _____

2) _____

3) _____

c. Unsafe conditions

1) _____

2) _____

3) _____

3. State injuries that may occur in the diesel shop according to their sources of accidents.

a. Grinder—_____

b. Batteries—_____

c. Loose clothing—_____

d. Lifting heavy objects—_____

e. Welding—_____

f. Spills on the floor—_____

4. Match basic types of accident injuries with the correct descriptions.

_____a.	Broken bone; may be closed or open	1.	Amputation
_____b.	Displacement of a bone at a joint	2.	Burn
_____c.	Loss of an arm or leg	3.	Contusion
_____d.	Twisting or wrenching of a joint or a muscle, usually with ligament damage also involved	4.	Dislocation
		5.	Electric shock, electrocution
_____e.	Damage to abdominal or pelvic body organs, usually caused by force	6.	Exposure to severe weather
_____f.	Break in the skin's surface, usually with bleeding involved	7.	Foreign body
_____g.	Tissue damage caused by fire or heat, chemicals, electricity, or certain radiations	8.	Fracture
		9.	Internal injury
_____h.	Entrance of an abnormal substance into the body	10.	Open wound
_____i.	Tissue damage caused by force; broken blood vessels under the skin cause discoloration	11.	Sprain, strain

5. Describe in the correct order the steps for giving first aid.

a. Primary steps of first aid

1) _____

2) _____

3) _____

4) _____

b. Secondary steps of first aid

1) _____

2) _____

3) _____

6. List four times to call for emergency medical service.

   —When the victim:

   a. _____

   b. _____

   c. _____

   d. _____

7. Select from the following list the information to give during an emergency phone call by placing an "X" in the appropriate blanks.

   _____a. Where victim is located

   _____b. Your occupation

   _____c. What you were doing before you found the victim

   _____d. What help (first aid) is being given

   _____e. How many are involved

   _____f. Your name

   _____g. Your home address and phone number (in case they need to contact you the next day)

   _____h. What happened

   _____i. Phone number where you are calling from

   _____j. Jokes to put everyone at ease

8. Distinguish between true and false statements concerning legal aspects of first aid by placing a "T" or "F" next to the true or false statements.

   _____a. Legally, you must always give first aid.

   _____b. Once you start first aid, you cannot stop until you can turn over the victim's care to medical workers.

   _____c. You must tell the victim who you are, how much training you have, and how you plan to help.

   _____d. Written consent must be obtained from every conscious, mentally competent adult. Oral consent is not enough.

   _____e. If a victim refuses consent, give first aid by force.

   _____f. Consent is implied for giving emergency life-saving first aid to an unconscious victim.

9. Match the contents of a first aid box on the right with the correct uses.

_____a.	Used to act as a barrier between the victim and the first aider when blood and body fluids are present	1.	Adhesive bandages
_____b.	Used to cleanse a wound area or your hands	2.	Adhesive tape, roll
_____c.	Used for cleaning and covering wounds	3.	Alcohol or antiseptic wipes
_____d.	Used for covering small wounds	4.	Antiseptic skin ointment
_____e.	Used to cut bandages and tape	5.	Face shield or mask
_____f.	Used to act as a barrier between the victim and the first aider when giving mouth-to-mouth breathing	6.	Gauze bandage, roll
_____g.	Used to remove splinters or insect stingers	7.	Gauze dressings or pads
_____h.	Used for wrapping around a wound or for holding a larger dressing on the wound area	8.	Gloves, disposable
		9.	Scissors
		10.	Tweezers

10. Complete statements concerning bloodborne pathogens and special first aid precautions by circling the correct answers.

a. In any situation involving blood or body fluids, there is a (small) (large) risk of infection from very serious bloodborne pathogens.

b. Bloodborne pathogens include HIV and hepatitis (A) (B).

c. Treat all victims as if they (were) (were not) infected because you cannot tell by looking at someone if they are infected with bloodborne pathogens.

d. Always wear (leather) (latex) gloves as a barrier.

e. Use face masks with a one-way valve for protection when performing (the Heimlich maneuver) (mouth-to-mouth breathing).

f. (Do) (Do not) eat, drink, or touch your mouth, nose, or eyes when giving first aid.

g. When cleaning up, vigorously wash your skin in (hot soapy water) (diluted bleach), and rinse well.

11. Complete statements concerning basic first aid procedures for various emergencies by circling the correct answers.

    a. For a severely bleeding cut on the left leg that will not stop, apply pressure to the left (brachial) (femoral) artery.

    b. For open fractures, (do) (do not) try to push the bone back into place.

    c. If a spinal injury is suspected, (do) (do not) move the victim.

    d. For second-degree burns, (do) (do not) break all visible blisters.

    e. (Do) (Do not) apply medicated ointment to third-degree burns.

    f. Check (poison control center) (MSDS) for more first aid instructions on how to treat chemical burns.

    g. (Do) (Do not) restrain anyone having convulsions and (do) (do not) try to place a pencil or wooden spoon between their teeth.

    h. The first thing to do when an electrical accident happens is to (shut off the electrical current) (perform CPR).

    i. For eye injures, (do) (do not) allow the victim to rub his/her eyes.

    j. A victim complaining of chest pain, nausea, and difficult breathing may be having a (stroke) (heart attack).

    k. A man working outside in the middle of a hot summer day faints. He has no perspiration and hot, red skin. His condition is called heat (exhaustion) (stroke).

    l. Victims of shock usually have (very cold) (very hot) skin.

12. Arrange in order the steps on how to treat choking by placing the correct sequence numbers (1 - 7) in the appropriate blanks.

    __4__ a. Make a fist of the other hand, and put the thumb side of the fist just above your finger on the belly button (and below the ribs).

    _____ b. Repeat the thrusts until they work or until trained help comes.

    _____ c. Wrap your arms around the victim's waist, and place your finger on their belly button.

    _____ d. If the victim cannot speak, stand directly behind him/her.

    _____ e. Take your finger off their belly button, and place this hand over your fist.

    _____ f. Ask the victim, "Are you choking?"

    _____ g. Give quick, upward thrusts into the abdomen. This forces air trapped in the lungs to push the object out of the airway.

13. Distinguish between true and false guidelines for giving mouth-to-mouth breathing by placing a "T" or "F" next to the true or false statements.

_____a. Check to see if victim is conscious or unconscious by patting his/her face and shouting out loud, "Snap out of it!"

_____b. The victim must be lying on his/her side so you can give them mouth-to-mouth breathing.

_____c. Tilt the victim's head back and lift his/her chin up to open the airway more.

_____d. Check victim's breathing for one minute.

_____e. If victim is breathing, begin CPR if trained.

_____f. If victim is not breathing, begin CPR if trained.

_____g. To give mouth-to-mouth breathing, pinch the victim's nose shut, put your mouth tightly over the victim's mouth, and gently give two breaths into the victim's mouth, each lasting about 1½ seconds.

_____h. If the person has a pulse but is not breathing, perform CPR if trained.

_____i. If the person has no pulse and is not breathing, perform CPR if trained.

_____j. Continue to give breaths with four-second waits between breaths until the victim starts to breathe or until trained help comes.

14. Complete statements on the basic steps for performing cardiopulmonary resuscitation by circling the correct answers.

a. If victim has a pulse but is not breathing, give (mouth-to-mouth breathing) (CPR).

b. If the person has no pulse and is not breathing, give (mouth-to-mouth breathing) (CPR).

c. The correct location to position your hands on the victim's chest is the (lower) (upper) end of the breast bone.

d. Position yourself (kneeling) (sitting) next to the victim with your shoulders directly over your hands, with your elbows locked.

e. Compress the chest by pressing down (1½ - 2") (3 - 4"), then release.

f. Push with the weight of your (arms) (upper body).

g. Keep a steady down-and-up rhythm, and (do) (don't) pause between compressions.

h. Give (5) (10) (15) compressions, then give 2 slow breaths.

i. This cycle of compressions and breaths takes about (15) (30) seconds total.

j. Give (4) (10) continuous cycles of CPR, and then check pulse.

***Permission to duplicate this test is granted.**

First Aid
Unit 3

Answers to Written Test

1.

a.	16	f.	10	k.	4
b.	8	g.	7	l.	23
c.	11	h.	6	m.	22
d.	1	i.	9	n.	24
e.	2	j.	13	o.	17

2. a. Unsafe acts—Any three of the following:

1) Cleaning, oiling, adjusting, or repairing of moving, energized, or pressurized equipment
2) Failure to receive proper instruction
3) Failure to use personal protective equipment
4) Failure to secure area or warn others of danger
5) Horseplay, quarreling, or fighting
6) Ignoring instructions or operating without permission or authority
7) Improper use of equipment
8) Improper use of hands or body parts
9) Inattention to footing or surroundings
10) Operating or working at unsafe speed
11) Removing safety devices
12) Using unsafe equipment

b Unsafe personal factors—Any three of the following:

1) Being under the influence of alcohol/drugs
2) Fatigue
3) Illness
4) Improper attitude
5) Lack of job knowledge or skill

c. Unsafe conditions—Any three of the following:

1) Defective tools, equipment, substances
2) Dress or apparel hazard
3) Environmental hazards such as temperature extremes or contaminated air
4) Hazardous methods or procedures
5) Inadequately guarded machines or area
6) Improper illumination
7) Improper storage of hazardous and flammable materials
8) Poor housekeeping

3. a. Grinder—May cause eye or face injury from flying sparks or metal chips
b. Batteries—May explode when near open flame or electrical spark
c. Loose clothing—May catch in rotating parts
d. Lifting heavy objects—May cause severe back injury
e. Welding—May cause injury to eyes and to skin if protective equipment is not worn
f. Spills on the floor—May cause falls

Answers to Written Test

4.

a.	8	d.	11	g.	2
b.	4	e.	9	h.	7
c.	1	f.	10	i.	3

5. a. Primary steps of first aid

   1) Make sure the victim is in a safe place.
   2) Check the victim's breathing.
   3) Check the victim's circulation.
   4) Stop any severe bleeding.

   b. Secondary steps of first aid (any three of the following:)

   1) Call for emergency medical help or have someone else make the call.
   2) Always have a reason for what you do.
   3) Stay calm. Talk to the victim.
   4) Ask the victim what happened and where he/she is hurt.
   5) Check for a medical alert bracelet, necklace, or wallet card.
   6) Take care of other injuries.

6. Any four of the following:

   a. Is unconscious, unusually confused, or seems to be losing consciousness
   b. Has trouble breathing, is breathing in a strange way, or is not breathing
   c. Has persistent chest pain or pressure
   d. Has pressure or pain in the abdomen that does not go away
   e. Is vomiting or passing blood
   f. Has seizures, severe headache, or slurred speech
   g. Appears to have been poisoned
   h. Has injuries to the head, neck, or back

7. a, d, e, f, h, i

8.

a.	F	d.	F
b.	T	e.	F
c.	T	f.	T

9.

a.	8	e.	9
b.	3	f.	5
c.	7	g.	10
d.	1	h.	6

10. a. Small
    b. B
    c. Were
    d. Latex
    e. Mouth-to-mouth breathing
    f. Do not
    g. Hot soapy water

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Answers to Written Test

11.
a. Femoral
b. Do not
c. Do not
d. Do not
e. Do not
f. MSDS
g. Do not, do not
h. Shut off the electrical current
i. Do not
j. Heart attack
k. Stroke
l. Very cold

12.

a.	4	e.	5
b.	7	f.	1
c.	3	g.	6
d.	2		

13.

a.	F	f.	F
b.	F	g.	T
c.	T	h.	F
d.	F	i.	T
e.	F	j.	T

14.
a. Mouth-to-mouth breathing
b. CPR
c. Lower
d. Kneeling
e. 1½ - 2″
f. Upper body
g. Don't
h. 15
i. 15
j. 4

First Aid
Unit 3

Unit Evaluation Form

Student Name _____ Unit Rating _____

Assignment Sheet 1—Determine Basic First Aid Measures for Given Emergency Situations Rating _____

Comments: _____

_____

Written Test Scores

Pretest _____ Posttest _____ Other _____

Other _____

_____

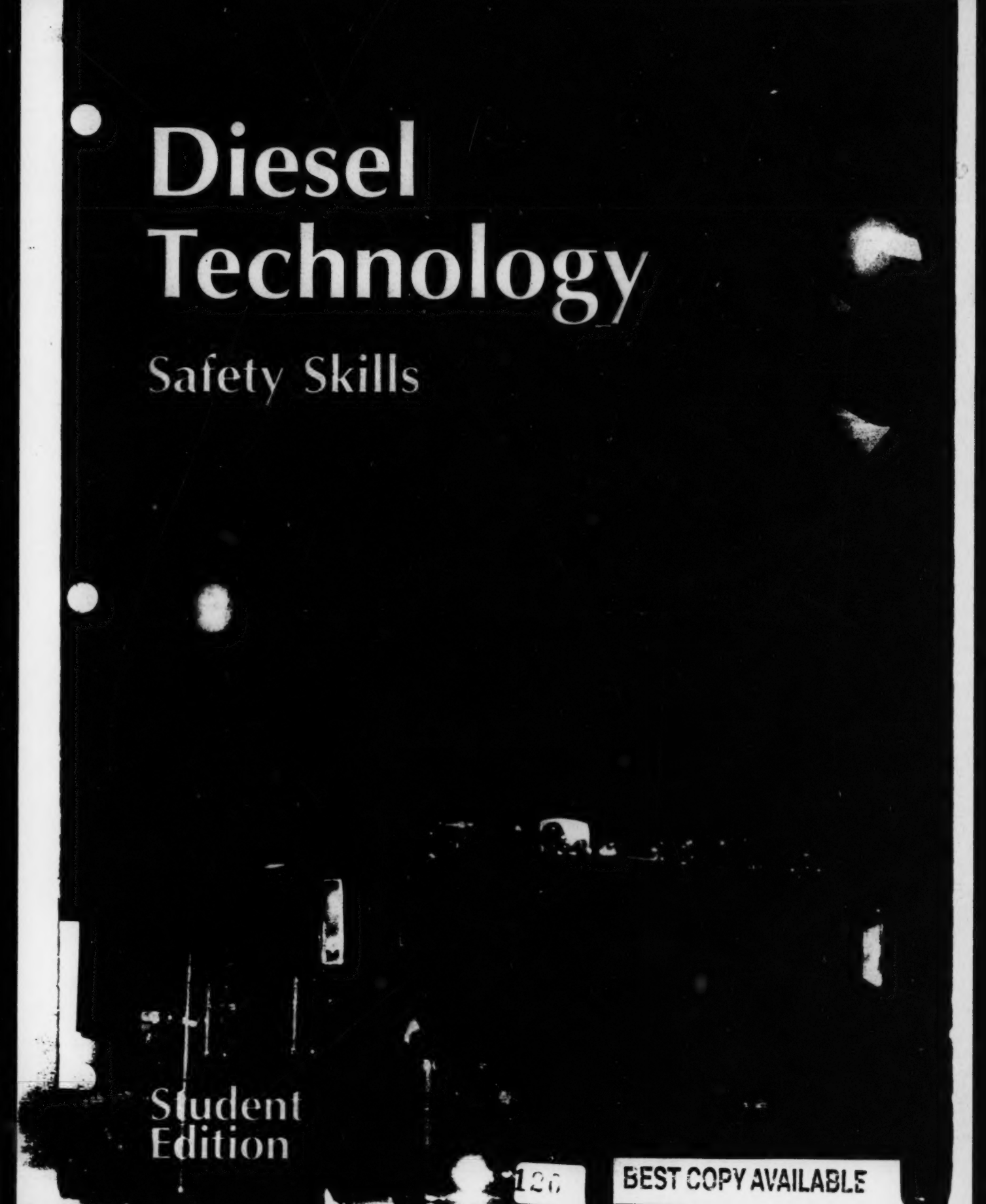
Teacher Signature _____ Date _____

Student Signature _____ Date _____

***Permission to duplicate this form is granted.**

Diesel Technology

Safety Skills



Student Edition

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Diesel Technology: Safety Skills

Student Edition

Written by

Mary Kellum

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Diesel Technology: Safety Skills

Student Edition

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General Safety
Unit 1

Objective Sheet

Unit Objective

After completing this unit, the student should be able to discuss general safety rules and apply them to the school and the workplace, determine the correct fire extinguishers to use for various situations, operate a fire extinguisher, and lift a heavy object properly. The student should demonstrate these competencies by completing the assignment and job sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to general safety with their correct definitions.
2. Discuss ways of developing a good safety attitude.
3. List expectations for a safe environment at school or work.
4. List basic types of emergencies.
5. Discuss severe weather guidelines.
6. Arrange in order the steps to follow in case of a bomb threat.
7. Describe how to conduct a fire evacuation.
8. Identify personal protective equipment.
9. Complete statements concerning personal safety guidelines.
10. Complete statements concerning guidelines for maintaining a safe work area.
11. Match causes of back injuries with their contributing factors.
12. Complete guidelines for lifting and moving items safely.
13. List components of a fire.
14. Match the classifications of fires with their correct fuel sources.
15. Distinguish among types of fire extinguishers.
16. Identify fire extinguisher markings.
17. Arrange in order the steps in using a fire extinguisher.

Objective Sheet

18. Discuss ways to prevent fires.
19. Subscribe to a safety pledge. (Assignment Sheet 1)
20. Apply general safety principles to the school and workplace. (Assignment Sheet 2)
21. Determine correct fire extinguishers to use for various situations. (Assignment Sheet 3)
22. Operate a fire extinguisher. (Job Sheet 1)
23. Lift a heavy object properly. (Job Sheet 2)

General Safety
Unit 1

Information Sheet

1. Terms and definitions

a. **Accident**—Any suddenly occurring, unintentional event that causes injury or property damage

b. **Carelessness**—Failure to think before one acts; failure to pay attention

c. **Drill**—Exercise practiced so that all members can demonstrate what to do in case of an emergency

d. **Emergency**—Any accident or sudden illness that requires immediate intervention to prevent severe damage or death

e. **Evacuation**—Moving people out of a disaster or dangerous area into a safe place

f. **Extinguish**—To put out a fire; to cause to cease burning

g. **Hazard**—Source of danger

h. **Personal protective equipment (PPE)**—Devices used or worn to protect the physical health of an equipment operator or tool user

i. **Safety**—Freedom from danger, risk, or injury

2. Developing a good safety attitude

Note: Developing a positive attitude toward safety can save your money, your job, and even your life! Don't think "it can't happen to me" because it does every day.

a. **Focus on the present task.** Stay alert. If you're tired or bored, accidents can happen.

b. **Take time to do the job right.** Staying safe may take a little extra time, but it will result in fewer mistakes. Determine what needs to be done first so you won't run out of time on high priority tasks.

c. **Use your head.** Do what you know is right. Don't take shortcuts or fool around. Also don't let emotions like anger or frustration get in the way of doing a good job.

d. **Take responsibility for your actions.** Others trust and depend on you to do your job correctly. If you do not act responsibly, others may suffer. Understand that safety is everyone's responsibility.

e. **Avoid unnecessary risks.** Think of what could happen if you take a chance on an unsafe task. Many risks are dangerous and are not worth it.

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Information Sheet

3. Expectations for a safe environment at school or work

a. Lighting is adequate to perform required duties and to prevent eyestrain.

b. Air is clean, without harmful fumes.

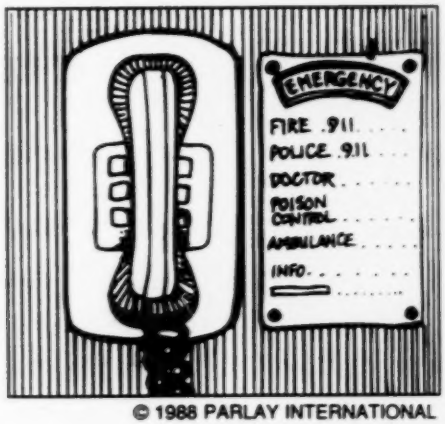
c. Alarms are located to notify everyone in case of emergencies.

d. Emergency exits are clearly marked, unlocked, and accessible.

e. Emergency telephone numbers are posted.

Example: Fire and police departments, ambulance service, poison-control center

Figure 1



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f. Fire extinguishers are readily available.

g. First aid supplies are available.

h. Walkways are clear, barrier-free, and accessible to all.

i. Safety rules are posted.

j. Evacuation routes are posted.

k. All students/employees receive safety training.

l. Personal protective equipment is available for all.

m. No smoking/smoking areas are designated.

Information Sheet

n. Adequate storage areas are provided for hazardous materials.

o. Hazardous materials are clearly identified.

Figure 2

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4. Basic types of emergencies

Note: Knowing what to do and then acting quickly may lessen the damage or injury involved in the following emergencies.

a. Severe weather and natural disasters—Tornados, hurricanes, earthquakes, floods, etc.

b. Bombs and bomb threats

c. Fires

d. Accidents—Falls, cuts, burns, electrical shocks, poisonings, etc.

e. Health problems—Heart attacks, strokes, seizures, heat exhaustion, etc.

Note: Accidents and health emergencies should be handled by trained personnel. Your job may be to call for help or to administer basic first aid. More information on first aid will be given in Unit 3.

5. Severe weather guidelines

a. When alarms (sirens) or warnings are issued by the local civil defense or national weather center, begin procedure to take cover.

b. Move quickly and quietly to shelter area on the lowest level and in the interior of the building away from glass and outside openings.

c. Sit down and protect yourself by putting your head as close to your lap as possible, or kneel down and cover your face and head with your arms.

d. Answer to roll call if at school.

e. Remain in designated area until the signal is given to return.

Information Sheet

6. Steps to follow in case of a bomb threat or threatening telephone call

a. When you answer the call, obtain as much information as possible from and about the caller. Record the call if possible.

Examples: Male, female, background noises, accent, voice characteristics

b. Alert your instructor, supervisor, or building administrator immediately.

c. Begin building evacuation immediately.

d. A building search will be conducted by police/bomb squad.

d. An "All Clear" signal will be given when it is safe to return to the building.

7. Fire evacuation guidelines

a. Upon discovery of a large fire or smoke or activation of a smoke detector, you should:

(1) Pull the nearest fire alarm.

(2) Close the doors around the fire to contain it.

(3) Notify the building administrator or telephone operator (0 or 911) of the fire and its exact location.

b. Evacuate building as soon as alarm sounds in the following manner:

(1) Remain calm and move quickly to exits. Do not use the elevators.

(2) Close windows and doors as you leave your area. This limits the amount of oxygen the fire receives and prevents the spread of smoke.

(3) Feel closed doors before opening them. Doors that are hot indicate a fire on the other side.

(4) If you are unable to exit through the door and you must wait for rescue through windows, place wet cloths on the floor next to the door to prevent the spread of smoke into the room. A wet towel over the head will help if you must walk through smoke to an exit. DO NOT ENTER THICK SMOKE.

(5) Once at the designated area, remain calm and stay with your group. All persons must be accounted for.

Information Sheet

8. Types of personal protective equipment

Note: This includes the personal protective equipment required by *OSHA 29 CFR 1910. 132-140.*

a. Eye protection

1) Goggles

Figure 3

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2) Safety glasses with side panels

Figure 4

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3) Face shield (to be used with safety glasses or goggles as additional face protection)

Figure 5

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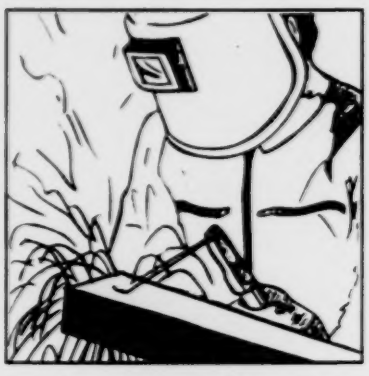
4) Welding helmet with filter lenses

Figure 6



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b. Hearing protection

1) Ear plugs

Figure 7

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Ear plugs are positioned in the outer part of the ear and may reduce noise by as much as 30 decibels.

2) Ear muffs

Figure 8

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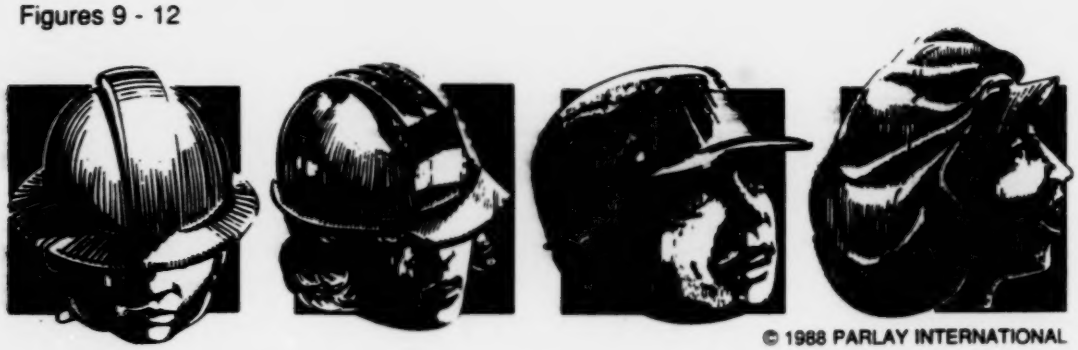
Muffs cover the entire ear and can reduce noise by as much as 15-30 decibels.

Note: Muffs may be used with ear plugs when a worker is exposed to extremely high noise levels—105 decibels and above.

c. Head protection—Hard hats and hair covers

Figures 9 - 12



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A full-brimmed hard hat protects against blows to the entire head, neck, and shoulders.

A visored hard hat (front-brim only) is often used when working in confined spaces.

Bump caps are used in confined spaces where there are no serious head hazards.

Hair covers help prevent hair from becoming caught in moving machine parts.

Information Sheet

d. Foot protection

1) Safety shoes, steel reinforced toe box and insole

Figure 13

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Steel-reinforced safety shoes protect your feet from falling or rolling objects, cuts, and puncture injuries.

2) Safety boots

Figure 14

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Boots offer more protection when splash or spark hazards (chemicals, molten materials) are present.

e. Hand protection—Work gloves

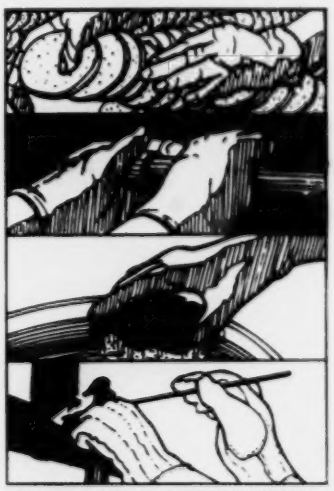
1) Disposable gloves—For handling mild irritants

2) Fabric gloves—For better grip on slippery objects

3) Rubber gloves—For use around chemicals and other corrosives

4) Leather gloves—For working with rough surfaces

Figures 15 - 18



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f. Respiratory protection—Respirators

Figures 19 - 21

Filtration respirators filter or "screen" out contaminants from the air you breathe.

Purifying respirators contain replaceable chemical cartridges or canisters that "purify" or entrap contaminants.

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Air-supplying (also called supplied-air) respirators provide clean air from an outside source.

9. Personal safety guidelines

a. Wear personal protective equipment as required.

Examples: Eye protection when using electric tools such as drills; respirator when painting; rubber gloves when using parts-cleaning solution; ear protection when running engines

b. Comply with all safety rules and posted signs.

c. Follow instructions when performing a task. Ask your teacher or employer questions if you do not understand.

d. Never operate, adjust, or repair equipment without permission and proper training.

e. Report defective tools and equipment immediately.

f. Report all accidents and get first aid immediately.

g. Correct or report all unsafe conditions immediately.

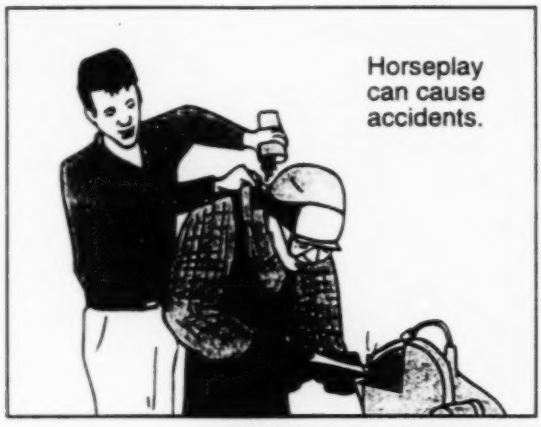
h. Keep mentally alert to shop hazards.

i. Conduct yourself in a manner conducive to safe shop practices.

Information Sheet

j. Never "horse around" on the job. Don't play around with equipment in class or at work. Don't play jokes on others to distract them when they are working.

Figure 22



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10. Guidelines for maintaining a safe work area

a. Arrange equipment and vehicles to allow safe working practices and ease of cleaning.

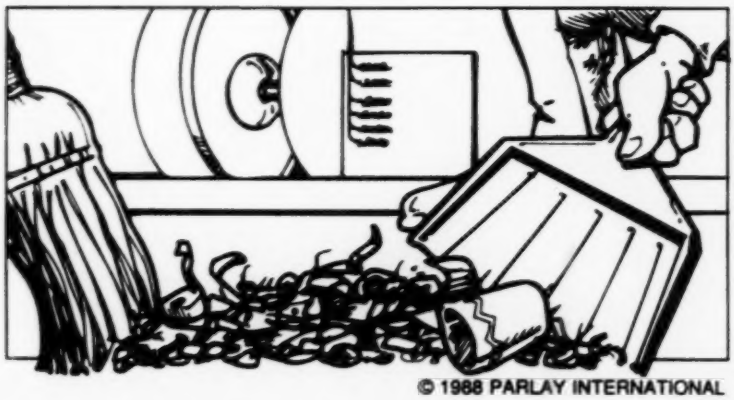
b. Store materials and supplies safely in their proper places.

c. Store tools and accessories safely in suitable storage containers or areas.

d. Keep work area organized and clear of debris and other hazards.

e. Keep floors clear of obstacles and slippery substances.

Figure 23



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f. Clean up spills immediately. Use a commercial oil absorbent to remove oily spills.

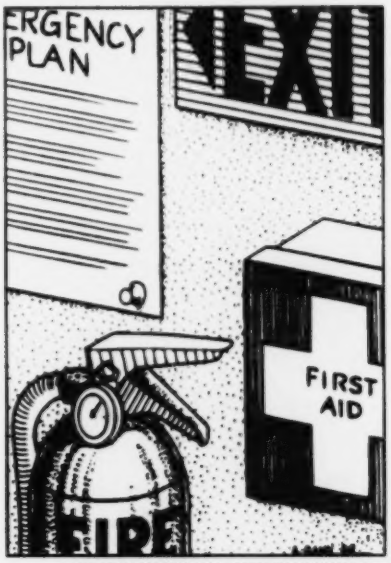
g. Keep aisles, exits, and traffic areas free of materials and debris.

h. Keep electrical cords and extension cords out of traffic areas.

i. Store oily, greasy, and paint-soaked rags in approved metal containers.

j. Know where first aid and fire fighting equipment are kept so they are immediately available in case of an emergency.

Figure 24



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11. Contributing factors and causes of back injuries

a. **Weight**—Injury usually results from overestimating your physical abilities and trying to lift more weight than you can handle.

Figure 25

Information Sheet

b. **Size**—Injury usually results from moving an object that may be within your weight capacity, but is too long, high, or wide to lift safely.

Figure 26

c. **Shape**—Injury usually results from moving an object that may be within your weight capacity, but has a cylindrical shape or other odd shape that makes safe lifting difficult.

Figure 27

d. **Obstructions**—Injury usually results from stacking materials so high that vision is limited and obstructions in the pathway cannot be seen.

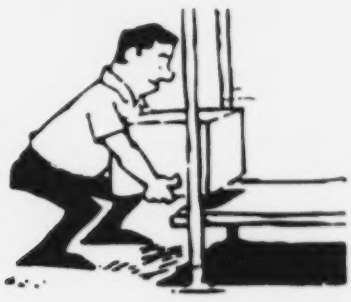
Figure 28

e. **Improper position**—Injury usually results from twisting or turning to an awkward position when lifting.

Figure 29

f. **Improper storage**—Injury usually results in strain caused by not storing heavy objects at least 12 inches off the floor.

Figure 30



g. **Improper reaching**—Injury usually results from using chairs or boxes to stand on instead of safely using a ladder, or by positioning object too far from work.

Figure 31

Information Sheet

12. Guidelines for manual lifting and moving

a. Before lifting

(1) Inspect the item to be lifted for jagged edges, splinters, and grease or other slippery surfaces.

Figure 32

(2) Wear gloves for protection, and make sure that they fit properly.

(3) Plan your route before you lift.

(4) Clear any obstacles from your path.

(5) Assess the weight of the load.

(6) Get help to lift heavy loads.

Note: Teamwork works best when both persons are about the same size. The load should be distributed evenly between both workers.

b. **Lifting**

(1) Place your feet as close to the load as possible and 8 to 12 inches apart for good balance.

Figure 33

(2) Bend your knees, keeping your back and neck straight and your chin tucked in.

(3) Grasp the load firmly with your fingers and hands.

(4) Draw your arms in close to your body.

Figure 34

Information Sheet

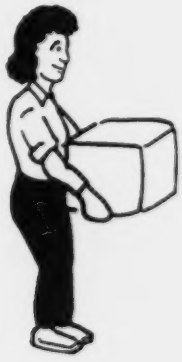
(5) Stand slowly and lift smoothly, using your legs.

Figure 35

c. **Carrying**

(1) Hold the item close to your body in a comfortable carrying position.

Figure 36



(2) Do not allow the load to block your vision.

(3) Do not twist your body to change direction. Turn with your feet and move your whole body.

Figure 37

d. **Setting the load down**

(1) Bend your knees.

(2) Keep your back and neck straight and aligned.

(3) Place the load carefully on the floor or shelf, taking care not to set it on your fingers or feet.

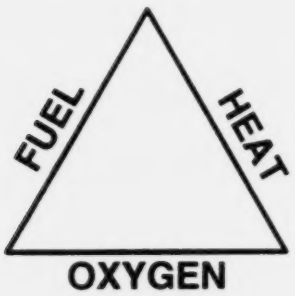
(4) Be sure the load is secure.

Figure 38

Information Sheet

13. Components of fire

Figure 39



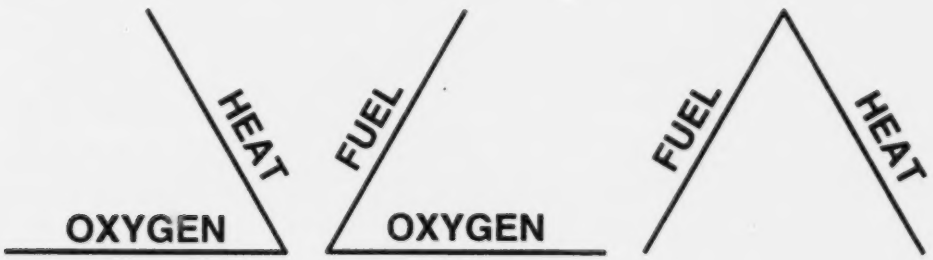
a. Fuel—Any combustible material

b. Heat—Enough to raise the fuel to its ignition temperature

c. Oxygen—Necessary to sustain combustion

Note: If any one of the three is missing, a fire cannot be started or, with the removal of any one of them, the fire will be extinguished.

Figure 40



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14. Classifications of fires (by their fuel sources)

a. **Class A**—Fires that occur with ordinary combustible materials

Examples: Wood, paper, trash, rags

Figure 41

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b. **Class B**—Fires that occur with flammable liquids

Examples: Gasoline, oil, grease, paints, diesel fuel

Figure 42

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Information Sheet

c. **Class C**—Fires that occur in or near electrical equipment

Examples: Wiring, electrical appliances, motors

Figure 43

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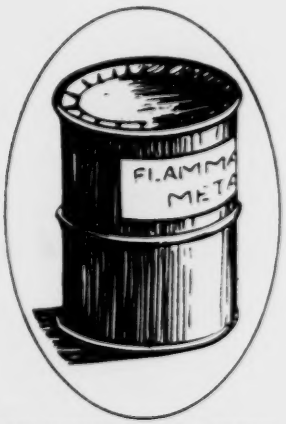
d. **Class D**—Fires from combustible metals

Examples: Magnesium; sodium, potassium, and sodium-potassium alloys

Note: These types of fires are more common in industrial settings. They require a special dry powder, Class D extinguisher.

Figure 44



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Information Sheet

15. Types of fire extinguishers

Note: Other types of fire extinguishers are available for specific applications. The ones listed here are the most common types.

a. Pressurized water—Used on Class A fires

b. Carbon dioxide—Used on Class B and C fires

c. Multi-purpose dry chemical—Used on Class A, B, and C fires

16. Fire extinguisher markings (Figures 45 - 48)

Class of Fire	Graphic Symbol (Color and shape)	Pictorial Symbol
Class A	A (Green Triangle)	
Class B	B (Red Square)	
Class C	C (Blue Circle)	
Class D	D (Yellow Star)	

Information Sheet

17. Steps in using a fire extinguisher

Note: Most small fires can be put out before they become large fires if you use the correct extinguisher and act quickly. However, if you have any doubts about being able to control it, evacuate and get help instead of trying to extinguish it yourself.

a. **Identify** the class of fire (A-D) and then make sure your fire extinguisher is coded to put out that type of fire. Check the label on the fire extinguisher.

Note: The most common type of fire extinguisher is the multi-purpose A-B-C extinguisher which can be used on those three classes of fires. Some extinguishers will only put out one class of fire. Check to make sure.

b. **Pull** the pin. Some extinguishers require releasing a lock latch, pressing a puncture lever, or other step.

c. **Aim** the extinguisher nozzle (or its horn or hose) at the base of the fire.

d. **Squeeze** the handle. This releases the extinguishing agent (carbon dioxide or other chemical).

Caution: Do not touch the nozzle of the fire extinguisher. The CO_2 released is 130 degrees below zero which will burn the skin.

e. **Sweep** from side to side until the fire appears to be out. Watch the fire area. If fire breaks out again, repeat the process.

Note: One way to remember this sequence is the first letters of the steps spell "I PASS". Most portable extinguishers work according to these directions. Follow the directions printed on the model you are using.

18. Ways to prevent fires

a. Keep equipment clean and in good operating condition.

b. Never overload electrical circuits.

c. Store flammable/combustible materials in appropriate containers away from heat sources.

d. Keep work and trash areas clean and free of debris.

e. Dispose of flammables according to established safety guidelines.

f. Never leave open flames unattended.

g. Use caution when operating spark-producing equipment.

h. Clean up spills (if appropriate) or report.

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Information Sheet

i. Report suspicious persons (possible arsonists) to security or supervisory personnel.

j. Keep fire exits/escape routes clear and well-marked.

k. Know where fire alarm boxes are located.

l. Know where fire extinguishers are located.

m. Always be on the lookout for fires or conditions that could cause a fire and report them immediately.

n. Properly dispose of cigarettes and matches.

o. Always obey "no smoking" signs and areas.

Figure 49

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General Safety
Unit 1

Assignment Sheet 1—Subscribe to a Safety Pledge

Name _____ Overall Rating _____

Evaluation criterion	Rating
Form is properly signed and dated	_____

Directions: Read the following safety rules, and if you agree to follow them, sign the pledge and date it. Your parent's signature is also required if you are under their supervision.

SAFETY PLEDGE

_____, who is a student enrolled in diesel technology, will be in contact with power equipment, hazardous materials, and some physical dangers involving engines.

This student will receive instruction about safety and correct procedures to follow to protect him/her from danger.

The student must assume the responsibility for safe practices, and we therefore ask that she/he subscribe to the following safety pledge:

1. **I will follow all safety rules.**
2. **I will never use a machine without first having permission from my instructor or supervisor.**
3. **I will not ask permission to use a particular machine unless I have been instructed in its use and have scored 100 percent on the safety test for that machine.**
4. **I will report immediately any accident or injury, no matter how minor, to my instructor or supervisor.**

Student's Signature _____ Date _____

I hereby give consent to allow my daughter/son to operate all equipment necessary in carrying out the requirements of the course.

Parent's (Guardian's) Signature _____ Date _____

General Safety
Unit 1

Assignment Sheet 2—Apply General Safety Principles to the School and Workplace

Name _____ Overall Rating _____

Evaluation criteria	Rating
Answers are appropriate	_____
Descriptions are complete with correct grammar, spelling, and punctuation	_____

Directions: Answer the following questions concerning safety in your school and at the work site. Be as specific as possible. Refer to your school handbook or information from your instructor and the "Policies and Procedures Manual" for your work facility.

1. PERSONAL PROTECTIVE EQUIPMENT

   a. What personal protective equipment are you required to wear at school?

   _____

   b. What at work? _____

   _____

   c. Under what situations will the requirements vary? _____

   _____

2. SAFETY PROCEDURES TO FOLLOW

   a. What should you do if you see an accident happen at school? _____

   _____

   _____

   b. Accident at work? _____

   _____

   _____

   c. What should you do if you are the first to discover a small fire at school?

   _____

   _____

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Assignment Sheet 2

d. Small fire at work? _____

_____

_____

e. What should you do if you are the first to discover a large fire at school?

_____

_____

f. Large fire at work? _____

_____

_____

g. What should you do if you answer the telephone at school and it is a bomb threat?

_____

_____

h. Bomb threat at work? _____

_____

_____

i. What should you do if you hear the severe weather alert (civil defense sirens or alarms) while you are at school? _____

_____

_____

j. Severe weather alert at work? _____

_____

_____

Assignment Sheet 2

3. SAFETY ATTITUDE

a. What can you lose if you don't follow the safety rules and established procedures at school and work? _____

_____

_____

b. Select an accident that you have had, or one that you have seen, and describe what could have been done to prevent it. _____

_____

_____

_____

_____

_____

c. How would you feel if you lost your eyesight in an accident that could have been prevented? How would that accident change your life? _____

_____

_____

General Safety
Unit 1

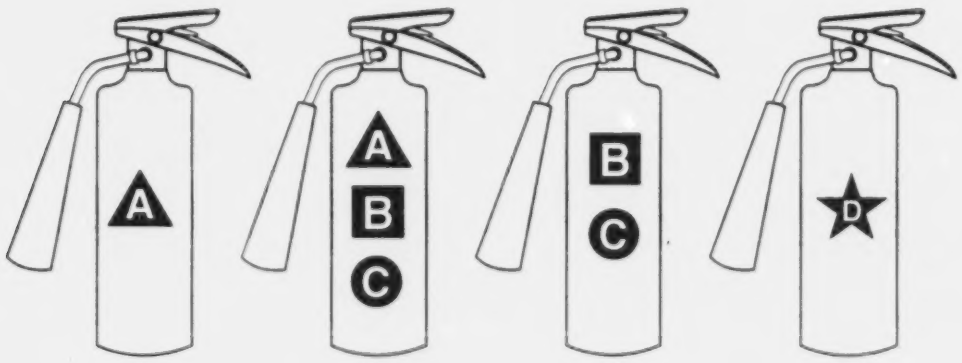
Assignment Sheet 3—Determine Correct Fire Extinguishers to Use for Various Situations

Name _____ Overall Rating _____

Evaluation criteria	Rating
Directions are followed	_____
Answers are correct	_____

Introduction: There are many fire hazards in the diesel technology shop. These include engines, electrical circuits, power tools, welding torches, batteries, and flammable solvents, oils, and fuels. For this reason, it is very important for you to be able to correctly respond to a fire.

Directions: Read each of the situations given and choose the correct fire extinguisher(s) that could be used. More than one answer is possible.



_____a. Fire in a filing cabinet containing old invoices

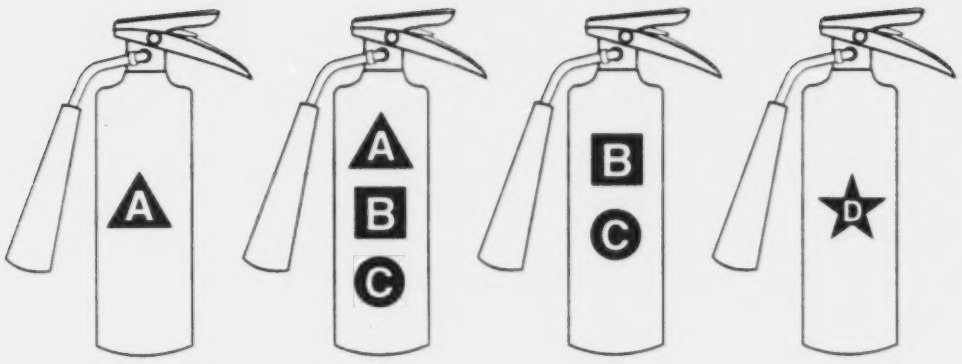
_____b. Smoke coming from the electric motor of an air compressor

_____c. Fire caused by cigarette ashes dropping into a vat of solvent

_____d. Smoke coming from a barrel of oily rags

_____e. An electric hot plate left unattended in an office ignites papers on a bulletin board and spreads to wood paneling

Assignment Sheet 3



_____f. Fire in an engine compartment that started because someone poured gasoline into a carburetor

_____g. Smoldering seat upholstery ignited by a cigar

_____h. Smoke coming from a battery charger

_____i. Puddle of spilled gasoline ignited by flames from a gas water heater

_____j. Smoke coming from a dash instrument panel

General Safety
Unit 1

Job Sheet 1—Operate a Fire Extinguisher

Name _____ Attempt Number _____

Date _____ Overall Rating _____

Evaluation criteria	Rating
Extinguisher was carried properly	_____
User was within stream reach of fire	_____
P-A-S-S sequence was followed	_____
Fire was completely extinguished	_____

Note: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Introduction: Using a portable fire extinguisher properly requires more than simple manipulation. You must always size up the fire and decide whether it can be extinguished with an extinguisher. If the fire is too large or too smoky, call the fire department. If the fire is small enough to be extinguished with an extinguisher, always fight it with your back to a means of escape.

A. Equipment and materials

1. Portable fire extinguisher suitable for a Class A fire
2. *Small* Class A fire in clear, safe area
3. Hose hooked up to a water source and with water in the hose (or another secondary means of extinguishment for backup)

Caution: This procedure should only be performed outdoors on a windless day and only under the direct supervision of your instructor.

B. Procedure

☐ 1. Pick up the fire extinguisher by its handle.

Note: *All* modern fire extinguishers are designed to be used in an *upright* position.

☐ 2. Read the fire extinguisher label to determine proper stream reach.

Note: *Stream reach* is the distance the extinguishing agent is propelled. Stream reach varies with extinguisher, and may range from 3 to over 20 feet. Normally, the smaller the extinguisher, the shorter the stream reach.

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Job Sheet 1

- ☐ 3. Walk—do not run—to within stream reach of the fire.
- ☐ 4. **Pull** the pin at the top of the extinguisher that keeps the handle from being pressed.

  Note: Pulling the pin automatically breaks the plastic or thin wire inspection band.
- ☐ 5. **Aim** the nozzle toward the fire, first releasing it from its clip if applicable.
- ☐ 6. **Squeeze** the discharge handle (above the carrying handle) to release the extinguishing agent.

  Note: The discharge handle can be released at any time to stop the discharge.
- ☐ 7. **Sweep** the nozzle back and forth at the base of the flames.
- ☐ 8. After the fire appears to be out, probe for remaining hot spots.
- ☐ 9. Make sure the fire is out by extinguishing any hot spots.

Evaluator's comments: _____

_____

_____

General Safety
Unit 1

Job Sheet 2—Lift a Heavy Object Properly

Name _____ Attempt Number _____

Date _____ Overall Rating _____

Evaluation criteria	Rating
Load was safely lifted	_____
Load was safely carried and set down	_____

Note: When you are ready to perform this task, ask your instructor to observe the procedure and rate your performance using the evaluation criteria.

Introduction: The number one worker injury in America today is back strain or injury. Most of these injuries come from trying to lift an object that is too heavy or from lifting an object improperly. It is very important, therefore, that you learn to assess the weight of a load to be lifted, and either get help to lift the load or lift the load properly, using your leg muscles, not your back.

A. Equipment and materials

1. Large, heavy box
2. Gloves
3. Lower-back support belt (optional)

B. Procedure

☐ 1. Put on gloves (and optional lower-back support belt if required by instructor).

☐ 2. Size up the load.

☐ 3. Place your feet close to the object and 8 to 12 inches apart for good balance.

☐ 4. Bend your knees to a degree that is comfortable.

☐ 5. Grip the box firmly with both hands.

☐ 6. Keeping your back straight and using your leg muscles, lift the box to waist height and hold close to your body.

Caution: Do not make any turning or twisting motions until the lift is complete.

☐ 7. Turn by changing foot position, making sure that your path is clear.

Job Sheet 2

- ☐ 8. Carry the box to the new location, using a normal walking gait and keeping your view unobstructed.
- ☐ 9. Reverse the lifting procedure to set the box down, taking care to bend your knees, keep your back straight, and avoid setting the box on your fingers or feet.

Evaluator's comments: _____

_____

_____

Workplace Safety
Unit 2

Objective Sheet

Unit Objective

After completing this unit, the student should be able to interpret material safety data sheets, apply the safety color code, identify workplace safety violations, and complete a safety inspection of the diesel technology shop. The student should demonstrate these competencies by completing the assignment sheets and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to workplace safety with their correct definitions.
2. Distinguish among the federal agencies that regulate hazardous materials and hazardous waste.
3. Complete statements concerning OSHA's role in workplace health and safety.
4. Distinguish between true and false statements concerning hazard communication.
5. Describe information on a chemical label.
6. Match information on a material safety data sheet (MSDS) with the correct descriptions.
7. List four characteristics of a hazardous material.
8. List three ways hazardous materials can enter the body.
9. Distinguish between the short-term and long-term health effects from exposure to hazardous materials.
10. Identify hazards using the hazardous material diamond classification system.
11. Complete a chart of hazardous materials that may be found in the diesel technology shop.
12. Select from a list the hazardous waste products associated with the diesel technology shop.
13. Complete statements concerning guidelines for storing and disposing of hazardous materials.
14. Distinguish between true and false statements concerning guidelines for using flammable materials and toxic substances.
15. Complete statements concerning equipment and tool safety guidelines.

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Objective Sheet

16. Complete statements concerning electrical safety guidelines.

17. Match the colors of the federal safety color code with the correct uses.

18. Match safety tags with the correct color codings.

19. Complete statements concerning general safety guidelines for working on vehicles.

20. Complete statements concerning an overview of asbestos and guidelines for reducing asbestos exposure.

21. Interpret material safety data sheets. (Assignment Sheet 1)

22. Compile a list of hazardous materials found in your shop and provide additional information on the most common materials. (Assignment Sheet 2)

23. Apply the safety color code to diesel technology shops. (Assignment Sheet 3)

24. Identify workplace safety violations. (Assignment Sheet 4)

25. Complete an individual student shop safety inspection. (Assignment Sheet 5)

Workplace Safety
Unit 2

Information Sheet

1. Terms and definitions

a. **Carbon monoxide**—Colorless, odorless, poisonous gas formed by incomplete combustion

b. **Combustible**—Capable of bursting into flames at temperatures above 100°F

c. **Conductor**—Material that allows the transmission of electricity

Examples: Metals, carbons, water

d. **Corrosive/caustic**—Capable of dissolving metals and/or burning skin and eyes

Example: Battery acid

e. **Electricity**—Fundamental entity of nature usually used as electrical current

f. **Environmental Protection Agency (EPA)**—Federal agency designed to protect our natural resources (air, water, soil, plants, animals, etc.) from contamination due to hazardous and toxic substances

g. **Exposure**—Unprotected contact with a harmful substance

h. **Exposure limit**—Level of a material you can be exposed to each day with no adverse effects

Examples: Threshold limit value (TLV), Permissible Exposure Limit (PEL)

i. **Flammable**—Capable of being easily ignited and burning quickly at temperatures below 100°F

j. **Flash point**—Temperature at which a substance will catch fire

k. **Grounded**—Electrical connection to an object that conducts electrical current to the earth

l. **Hazardous material**—Any substance that could cause injury or death to a person or damage to the environment

m. **Hazardous waste**—Unwanted by-products that are ignitable, corrosive, reactive, or toxic

n. **Insulator**—Material that does not allow the transmission of electricity

Examples: Glass, rubber, plastic

Information Sheet

o. **Material safety data sheet** (MSDS)—Form that explains a hazardous material that an employee works with so the employee can safely use the material and respond to emergency situations

p. **Occupational Safety and Health Act** (OSHA)—Federal legislation designed to ensure safe and healthful working conditions for employees

q. **Reactive**—Capable of burning, exploding, or giving off harmful vapors if mixed with air, water, heat, or other materials

Examples: Explosives, oxidizers, unstable chemicals

Note: Reactives should be handled with extreme caution. They can explode under what seem to be safe conditions such as when hot or when being moved.

r. **Solvent**—Chemical that dissolves another substance

Examples: Degreaser, paint thinner, industrial cleaner

s. **Toxic**—Capable of causing illness or death after exposure, even at very low levels

t. **Volatile**—Readily vaporized at a relatively low temperature

Note: Many petroleum products are volatile, and their fumes (vapors) should be avoided.

2. Federal agencies that regulate hazardous materials and hazardous waste

a. **Occupational Safety and Health Administration (OSHA)**—Regulates hazards in the workplace, including worker exposure to hazardous materials. Regulations are found in CFR 29.

Note: CFR stands for *Code of Federal Regulations*.

b. **Department of Transportation (DOT)**—Regulates the transportation of hazardous materials, including the packaging, labeling, placarding, and transporting (for use or disposal). Regulations are found in CFR 49.

c. **Environmental Protection Agency (EPA)**—Regulates the disposal of hazardous waste. Regulations are found in CFR 40.

Note: In addition to federal regulations, many state and local governments have additional regulations.

3. OSHA's role in workplace health and safety

a. The Occupational Safety and Health Act was signed on December 29, 1970.

b. The U.S. Department of Labor created the Occupational Safety and Health Administration (OSHA) to oversee the Act.

Information Sheet

c. OSHA issues standards and rules for safe and healthful working conditions, tools, equipment, facilities, and processes.

d. OSHA also conducts workplace inspections to assure that standards are followed. Penalties may be levied for noncompliance.

e. OSHA sets two major requirements for employers:

(1) To provide work and a workplace free from recognized hazards

(2) To comply with OSHA regulations

f. OSHA sets one major requirement for employees:

— To comply with all occupational safety and health standards and all rules, regulations, and orders issued under the Act.

g. The Act and the standards issued by OSHA apply to every private employer with one or more employees, except for those covered by other federal legislation such as the Atomic Energy Act and the Coal Mine Safety Act.

4. Hazard communication (HazCom)

a. OSHA established the Hazard Communication Standard (HCS or HazCom) to protect the health and safety of employees.

b. This standard states that employees:

(1) Have the need and a "right to know" the hazards and the identities of the chemicals they are exposed to when working.

(2) Also have a need to know what protective measures are available to prevent adverse effects from occurring.

c. OSHA requires employers to develop a written HazCom program including:

(1) Warning labels on containers

Figure 1

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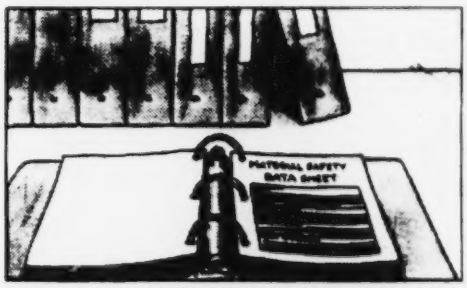
(2) Material Safety Data Sheets (MSDS) readily available to employees

Figure 2



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(3) Employee training on the proper handling, usage, storage, and transportation of chemicals

Figure 3

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5. Information on a chemical label

a. Chemical name and ingredients

b. Name, address, and phone number of the manufacturer or distributor

c. Procedures for usage, handling, storage, and disposal

d. How to handle spills and leaks

e. Signal words identifying chemical as hazardous

(1) Caution—Least severe

(2) Warning—Very severe

(3) Danger—Most severe

Information Sheet

f. Critical first aid instructions and type of fire extinguisher to use

g. Personal protective equipment to wear when using the chemical

h. Other information about the chemical

(1) Flammability

(2) Radioactivity

(3) Reactivity—Uses words "incompatible," "unstable," and "volatile"

(4) Toxicity

Note: Never use a chemical without reading its label. If the label is missing, immediately notify your instructor/supervisor.

6. Information on a material safety data sheet (MSDS)

Note: Each company can design its own MSDS form, and the sections may be in a different order than the following list. However, they must include all of the following information.

a. **Chemical name**—Lists the identity of the substance, the date that MSDS was prepared, name and address of the manufacturer, and usually a phone number for emergencies

b. **Hazardous ingredients/chemical identity**—Includes names of substances in the chemical that might be dangerous, safe exposure limits, and common names for the chemical

c. **Physical characteristics**—Describes usual or safe physical qualities such as how it looks or smells, boiling and melting temperatures, evaporation rates, how easily it dissolves, and how heavy it is (compared to water)

d. **Fire and explosion data**—Identifies flash point, flammability, combustibility, and the best way to put out a fire involving that chemical

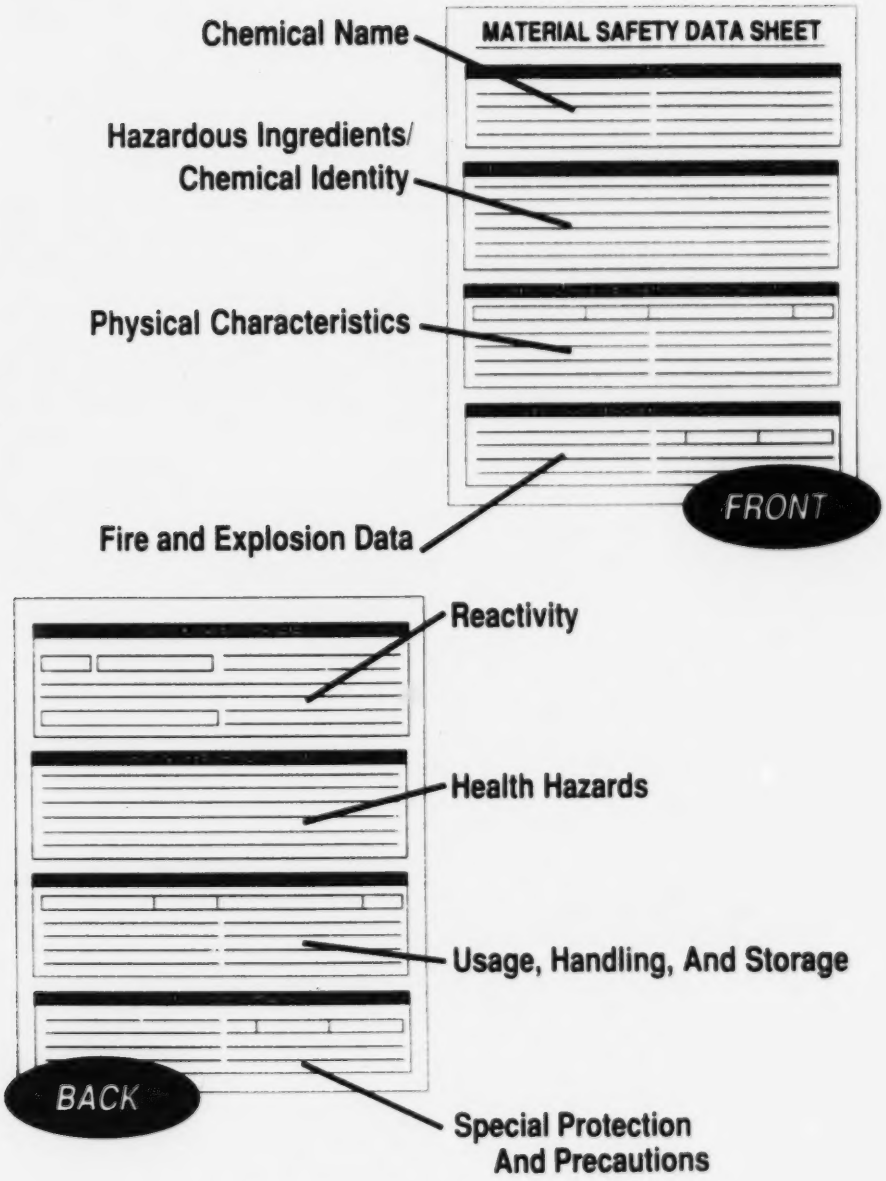
e. **Reactivity**—Describes what happens if this chemical comes in contact with certain conditions (like heat) or chemicals (like air, water, others)

f. **Health hazards**—Lists ways the chemical might enter your body, symptoms of overexposure, and emergency first aid procedures

g. **Usage, handling, and storage**—Describes how to clean up an accidental spill, leak, or release, including special precautions; tells how to handle, store, and dispose of chemical safely

h. **Special protection and precautions**—Explains special personal protective equipment (PPE) and other equipment to use when working with the chemical and extra health and safety information not covered in other sections

Figure 4



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Information Sheet

7. **Characteristics of a hazardous material**

Note: If the MSDS or label lists any of these properties or characteristics, then the material is considered hazardous.

a. Flammable

b. Corrosive

c. Reactive

d. Toxic

Figure 5

8. **Ways hazardous materials can enter the body**

a. **Ingestion**—Swallowing by mouth

Example: Swallowing paint thinner

b. **Absorption**—Contacting the skin or eyes

Example: Getting battery acid on your hands

c. **Inhalation**—Breathing in gases, vapors, fumes, or other airborne forms of a material

Example: Inhaling carbon monoxide fumes from equipment exhaust

9. **Health effects from exposure to hazardous materials**

a. **Short-term effects**—Minor symptoms resulting from a brief encounter with a chemical

Examples: Pain, nausea, itching skin, burning eyes, headache, vomiting

b. **Long-term effects**—Severe, ongoing illness resulting from repeated or prolonged encounters with a chemical

Examples: Cancer, asbestosis, emphysema, sterility, kidney damage

Note: Effects from exposure to hazardous materials may be delayed without evidence for years. By then the damage is done and can't be reversed. This is why it is so important to follow all precautions around hazardous materials.

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Information Sheet

10. Hazardous material diamond classification system

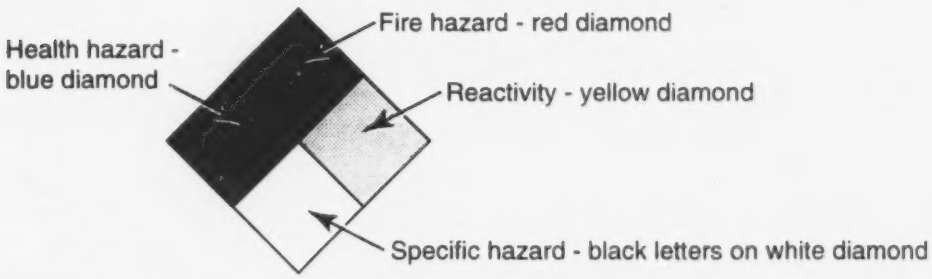
Note: This system is commonly used on chemical storage containers, as well as vehicles transporting hazardous materials. The diamonds are a quick way to identify how hazardous a chemical is. They are based on the coding system of the National Fire Protection Association (NFPA).

a. The classification system consists of a large diamond made up of four smaller diamonds. Each diamond represents a different characteristic and is represented by a different color.

Table 1

Diamond Location	Characteristic	Diamond Color
Left-hand diamond	Health hazard	Blue
Top diamond	Fire hazard	Red
Right-hand diamond	Reactivity	Yellow
Bottom diamond	Specific hazard	Black on white

Figure 6


Health hazard - blue diamond
Fire hazard - red diamond
Reactivity - yellow diamond
Specific hazard - black letters on white diamond

b. Health, fire, and reactivity hazards are rated according to their severity on a scale of 0 - 4 with 0 meaning "no hazard" and 4 meaning "severe hazard."

Table 2

Rating #	Health Hazard Meaning	Fire Hazard Meaning (Flash Points)	Reactivity Hazard Meaning
4	Deadly	Below 73°F	May detonate
3	Extreme danger	Below 100°F	Shock and heat may detonate
2	Hazardous	Below 200°F	Violent chemical change
1	Slightly hazardous	Above 200°F	Unstable if heated
0	Normal material	Will not burn	Stable

Information Sheet

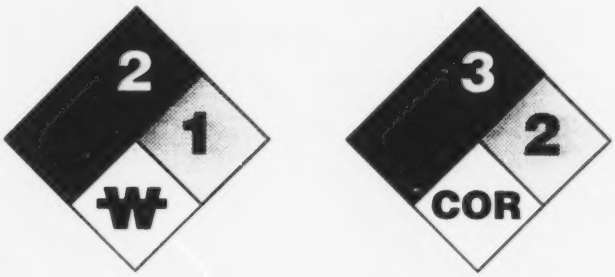
c. Other specific hazards are identified with abbreviations or symbols.

Table 3

Specific Hazard	Abbreviation or Symbol
Oxidizer	OXY
Acid	ACID
Alkali	ALK
Corrosive	COR
Use NO WATER	W
Radiation hazard	

Examples: Chemical #1 Chemical #2

Figure 7



Chemical #1 presents an extreme danger to your health, it will burn below 200°F, and it is unstable if heated. Do not use water on this chemical.

Chemical #2 is a corrosive that is hazardous to your health. It is very flammable with flash point below 100°F, and is capable of violent chemical change.

Note: Remember—The greater the number, the greater the hazard.

11. **Hazardous materials that may be found in the diesel technology shop (*OSHA 29 CFR Parts 1910 H and Z*)**

Note: These chemicals will be identified as hazardous ingredients on the MSDS for various products used in the diesel technology shop. Many manufacturers are reformulating their products to eliminate or reduce these hazardous materials. Always check the MSDS to be sure about the content of a product.

Table 4

Hazardous Material	Common Uses	Dangers
Asbestos	Used as fireproofing	Do not inhale asbestos dust. Can cause serious long-term lung damage and disease.
Benzene	Used in many solvents and in some motor fuels	Avoid all contact and inhalation. Can damage skin, eyes, and nervous system.
Cadmium	Used as protective plating on some bolts and batteries	May be formed into metal dust when cutting or grinding on products made of or covered with this material. Avoid breathing this dust. Can cause serious lung damage.
Carbon monoxide, nitrous oxide, and other exhaust fumes	Unwanted waste products of internal combustion engines	Avoid inhalation. Fumes interfere with body's use of oxygen. Can cause death by suffocation.
Chlorine and its compounds	Used in many cleaners and chlorinated solvents	Avoid all contact and inhalation. Can damage skin, eyes, and nervous system.
Compressed and liquefied gases, including oxygen, acetylene, butane, propane, hydrogen, refrigerants (R 12 and R134 A), compressed natural gas (CNG), and liquefied petroleum gas (LPG)	Used as fuels and as components of other processes	Handle with care. Pressurized containers may explode. Also avoid breathing fumes.
Ether, ethyl, and its compounds	Used in antifreeze, several solvents, starting fluids, and some fuel additives	Avoid all contact and inhalation. Can damage skin, eyes, lungs, and nervous system.

Information Sheet

Table 4 (cont.)

Hazardous Material	Common Uses	Dangers
Flammable and combustible liquids, including all products containing petroleum or alcohol	Used as fuels, solvents, thinners, additives, sealants, and lubricants	Avoid contact and inhalation. Can damage skin, eyes, and nervous sytem. Also use extreme care because all are a fire hazard.
Lead	Used in pipes, cables, batteries, radiators, and solder	May be formed into metal dust when cutting or grinding on products made of this toxic heavy metal. Avoid breathing this dust. Can cause severe damage to the nervous system.
Methyl and its compounds	Used in solvents, paint removers, and adhesives	Avoid contact and inhalation. Can damage skin, eyes, lungs, and nervous system.
Sulfuric acid	Used in battery electrolyte	Avoid contact and inhalation. Can damage skin, eyes, lungs, and nervous system.

12. **Hazardous waste products associated with the diesel technology shop**

a. Contaminated water

b. Contaminated fuel

c. Waste oil

d. Waste antifreeze

e. Waste solvent

f. Waste caustic/corrosive

Example: Acids in hot tanks (special parts cleaner)

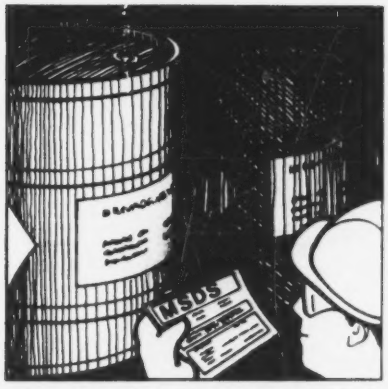
Information Sheet

13. Guidelines for storing and disposing of hazardous materials

a. Storage

(1) Refer to the MSDS and your school/company policies for specific storage requirements.

Figure 8



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(2) Store hazardous materials in approved safety containers. These should be tightly closed.

(3) Store flammable/combustible materials separate from corrosives and reactives.

(4) Store flammables in temperature-controlled areas away from heat and electric sources

(5) Store hazardous materials in locked metal cabinets or locked storage areas.

b. Disposal

(1) Dispose of hazardous materials according to the MSDS and your school/company policies.

Information Sheet

(2) Use only approved containers for waste disposal. Different containers are used for different waste products.

Examples: Waste oil in waste oil cans or tanks, waste caustics in caustic tanks

Figure 9

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(3) Never pour hazardous materials into the drain, sewer, or garbage can, or onto the ground.

(4) If your clothing or other materials are contaminated by hazardous materials (such as spilling fuel or oil on your coveralls), remove the contaminated clothes immediately. Then follow your school/company policies for disposal or decontamination of the clothing.

(5) The federal government through the Environmental Protection Agency (EPA) monitors hazardous waste disposal to make sure that several environmental laws passed by Congress are followed properly. These laws include the Clean Air Act, Clean Water Act, Safe Drinking Water Act, and the Resource Conservation and Recovery Act.

(6) Most hazardous waste products are sent to recyclers for disposal. Waste water must be pretreated and then sent to a municipal sewer system.

(7) The EPA can administer high fines and cleanup costs to businesses that are not disposing of their hazardous waste according to current laws.

(8) The EPA has also established guidelines to comply with the Clean Air Act for the recovery and recycling of motor vehicle air conditioning refrigerants. EPA-approved equipment must be used by trained and certified technicians who repair or service motor vehicle air conditioners.

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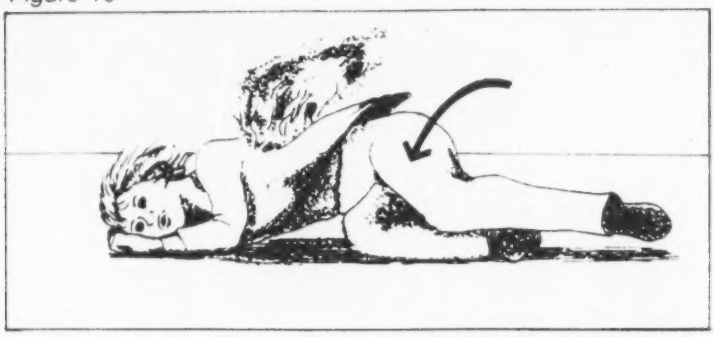
Information Sheet

14. Guidelines for using flammable materials and toxic substances (including solvents, corrosives, and reactives)

a. If your hair or clothing catches fire, do not run—Stop, drop, and roll to smother the fire, using a blanket if available.

Figure 10



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b. Carefully read and follow container label directions before using any flammable liquids or toxic substances. Refer to the MSDS for more detailed information.

c. Wear personal protective equipment (PPE) as specified on the MSDS to prevent eye and skin contact with flammable and toxic substances.

Examples: Chemical splash goggles, respirators, safety gloves, splash aprons, corrosive-resistant boots

Figure 11

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d. Use flammable and toxic chemicals in well-ventilated areas. Use fans, exhaust hoods, and approved ventilation systems.

e. Avoid breathing toxic fumes or gases. The gaseous vapors from flammable and toxic substances such as solvents and corrosives can cause serious internal damage if you inhale them.

Information Sheet

f. Know the location of the right type of fire extinguisher for the chemical you are using. The wrong extinguisher can spread a fire.

g. Know the location of eyewash stations, safety showers, spill control stations, and fresh air supply in case of contamination.

Note: These are for first aid, but contamination victims will also need medical care because their injuries can be very serious, even deadly.

Figure 12

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h. Take special care to handle, store, and dispose of flammable and toxic chemicals properly. Refer to the MSDS for detailed information.

i. Use flammable and toxic substances only for their intended purposes.

Example: Don't use gasoline or diesel fuel as a cleaner.

j. Keep flammables, corrosives, and reactives away from fire and sparks. Never smoke, cut, or weld around them.

Figure 13

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Information Sheet

15. Equipment and tool safety guidelines

a. Get into the habit of wearing safety glasses all day. Your employer will require it!

b. Always wear eye protection while performing the following operations:

(1) Grinding, chipping, or drilling

(2) Welding

(3) Working under equipment

(4) Operating abrasive discs

(5) Charging batteries

(6) Using caustic cleaning compounds

c. Remove rings and other jewelry when operating power equipment.

d. Secure long hair and loose clothing such as ties, scarves, or wide sleeves when working around power equipment.

e. Obey all safety rules and operating instructions provided by the equipment manufacturer, plus any additional ones used by your shop.

f. Keep tools and equipment clean and in safe working order.

g. Properly store tools and equipment when not in use.

h. Keep guards and safety devices in place on all equipment.

i. Tag and report to the supervisor/instructor any defective tools, machines, or equipment.

j. Turn off power equipment when not in use.

k. Operate equipment only after receiving training on how to use it properly and safely.

l. Use the correct tools for the job to be done.

m. **Never** use compressed air to clean yourself or your clothing. Do **not** direct compressed air toward another person.

n. Practice this tool motto: "Get, use, and put away."

Information Sheet

16. Electrical safety guidelines

Note: All electrical equipment is potentially hazardous and can cause fires, explosions, shocks, burns, and even death. Use with care.

a. Do not use any electrical appliance or equipment while you are touching metal or water.

b. Before performing any maintenance task such as oiling or cleaning on electrical equipment, disconnect (unplug) the power from energized tools and tag or lockout machine tools (if trained).

Figure 14

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c. Keep electrical equipment and work areas clean to prevent electrical fires. Electrical sparks could ignite any flammable material nearby.

d. Keep access to electrical panels and junction boxes clear.

e. Keep flammable materials away from electrical heat sources, including lights.

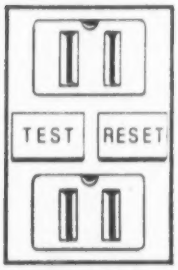
f. Know the location of fuses and circuit breakers.

g. Make sure all electrical equipment is properly grounded.

Note: Properly grounded equipment provides a pathway for stray current that may otherwise go through your body!

h. Plug power tools into grounded outlets installed with ground fault circuit interrupters (GFCIs).

Figure 15



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i. Never use water on electrical fires.

j. Report any of the following unsafe conditions to your instructor or supervisor immediately and do not use:

(1) Defective, frayed, or damaged cords

(2) Shocking, sparking, overheating, or smoking equipment

(3) Corroded or broken switches or outlets

(4) Extension cords in permanent use

17. Colors of the federal safety color code and their uses

Note: The federal safety color code system was put into effect so that dangers and safety equipment could be easily identified by anyone familiar with the code—even if he/she sees the colors in a new location.

a. **Federal safety red**

(1) Indicates danger

(2) Identifies fire protection equipment and its location

(3) Identifies portable containers of flammable liquids

(4) Identifies emergency stop bars, stop buttons, and electrical stop switches on machinery

b. **Federal safety yellow**

(1) Indicates caution and marks physical hazards

Examples: Low beams, steps, pits

(2) Indicates waste containers for explosive or combustible materials

(3) Indicates equipment that should **not** be started, used, or moved

(4) Identifies the starting point or power source for machinery

c. **Federal safety orange**

(1) Identifies dangerous parts of equipment that could cut, crush, shock, or otherwise injure

(2) Indicates safety starter buttons

Information Sheet

d. **Federal safety purple** (or magenta or black on safety yellow)—Indicates radiation hazards

e. **Federal safety blue**—Identifies tags that indicate equipment that should **not** be started, used, or moved

f. **Federal safety black and white**

(1) Indicate traffic-flow paths

(2) Indicate storage areas

(3) Identify housekeeping equipment and its location

g. **Federal safety green**

(1) Identifies safety equipment other than fire fighting equipment and its location

(2) Identifies first-aid equipment and its location

18. Color coding of safety tags or signs

a. Do not start tag

(1) White tag

(2) White letters on red square

Figure 16

b. Danger tag

(1) White tag

(2) White letters on red oval, on black square

Figure 17

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c. Caution tag

(1) Yellow tag

(2) Yellow letters on black square

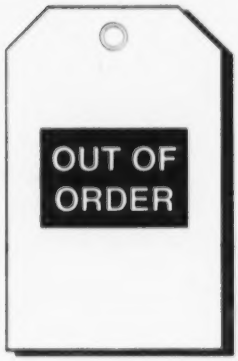
Figure 18

d. Out of order tag

(1) White tag

(2) White letters on black square

Figure 19



19. General safety guidelines for working on vehicles

a. Be sure an appropriate fire extinguisher is nearby when starting or running a vehicle in the shop.

b. Be sure vehicle is out of gear before starting it.

c. Use extreme caution when moving a vehicle in the shop. Check around the vehicle and the planned path to make sure there are no obstacles in the way.

d. Use a spotter to help you if trying to maneuver or park a vehicle in a close area.

e. Do **not** leave a vehicle running in the shop without adequate exhaust-removal equipment in place.

f. Be careful about moving parts on the vehicle, such as belts and fans.

Note: Remember that many vehicles have electrically- or air-operated fans that can run any time the switch is on, even if the engine is not running.

g. Be careful about parts that heat up during engine operation.

Examples: Exhaust pipes and manifolds, coolant hoses

Information Sheet

h. Do **not** allow tools or other metal objects to contact both battery terminals at the same time.

i. Wear safety glasses, gloves, and protective clothing when handling batteries.

j. Wear your safety belt whenever you ride in or drive a vehicle, including test drives—no matter how short.

k. Avoid using remote starts. Start the vehicle with the ignition switch to ensure proper control.

l. Warn other workers in the area and clear workers from the engine area when starting a vehicle.

20. **Overview of asbestos and guidelines for reducing asbestos exposure *(OSHA 1910.1001, Appendix F)***

a. Asbestos is the name of a class of magnesium-silicate minerals that occur in fibrous form.

b. Asbestos is used in the manufacture of heat-resistant clothing, automotive brake and clutch linings, and a variety of building materials including floor tiles, roofing felts, ceiling tiles, fire-resistant drywall, and some insulations.

c. Asbestos can cause disabling respiratory disease (asbestosis) and various types of cancers (lung, stomach, colon) if the fibers are inhaled. Symptoms of these diseases generally do not appear for 20 or more years after initial exposure.

d. The potential for a product containing asbestos to release breathable fibers depends on its degree of friability. Friable means that the material can be crumbled with hand pressure and is therefore likely to emit fibers.

e. The permissible exposure limit (PEL) for asbestos is 0.1 fibers per cubic centimer of air (0.1 f/cc) averaged over the 8-hour workday.

f. OSHA recommends the following practices to reduce asbestos exposure to levels below the PEL:

(1) Engineering controls (including approved brake cleaning equipment)

(2) Exposure monitoring (to make sure exposure is below the PEL)

(3) Respirators and protective clothing (if exposure exceeds PEL)

(4) Hygiene facilities (clean change rooms, lockers, and showers for containment and decontamination)

(5) Warning signs and labeling (to regulate areas and caution workers about materials containing asbestos)

(6) Recordkeeping and medical exams (to monitor employee exposure)

Information Sheet

g. In the diesel technology shop, there are two preferred methods for brake and clutch inspection, disassembly, repair, and assembly:

(1) Negative pressure enclosure with HEPA (high efficiency particulate air) vacuum system

(2) Low pressure/wet cleaning brake cleaning equipment (most common)

Note: Equivalent methods must be proven to OSHA to be just as effective as the preferred methods.

h. Every effort should be made in the shop to prevent asbestos fibers from becoming airborne.

(1) Do not clean brake drums or clutches with the air blow gun. That would spread particles all over the shop.

(2) Use wet rags to wipe off asbestos surfaces.

Workplace Safety
Unit 2

Student Supplement 1—Sample MSDSs

MSDS 1

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMg No. 44-R1347

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
Duracell Inc.	203-796-4155 914-591-7000

ADDRESS (Number, Street, City, State, and ZIP Code)
Berkshire Industrial Park, Bethel, CT 06801

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Alkaline Manganese Cell	DURACELL Alkaline Battery
CHEMICAL FAMILY KOH, MnO_2, Zn, Hg	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES		%	TLV (Units)
KOH	Potassium hydroxide	20	2 mg/m^3 (ceiling)
MnO	Manganese dioxide	60	5 mg/m^3 (ceiling)
Zn	Zinc	19	15 mg/m^3
Hg	Mercury	1	1 mg/m^3

SECTION III - PHYSICAL DATA

BOILING POINT (°F)	2408 (KOH) 674 (Hg)	SPECIFIC GRAVITY (MgO_2=1)	2.04(KOH) 13.6(Hg)
VAPOR PRESSURE (mm Hg)	NA(MnO_2) 1885(Zn)	PERCENT VOLATILE BY VOLUME (%)	5.03 (MnO_2) 7.14(Zn)
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____=1)	
SOLUBILITY IN WATER	50%(KOH) 0(MnO_2, Zn, Hg)		

APPEARANCE AND ODOR: KOH-clear liquid, MnO_2-black powder, Zn-grey powder, Hg-amalgamated w/Zn

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used)	FLAMMABLE LIMITS	Lel	Uel
NA			

EXTINGUISHING MEDIA

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Batteries may release toxic mercury vapors when battery-can integrity is broken.

Form OSHA-20
Rev. May 72

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Student Supplement 1

MSDS 1

SECTION V - HEALTH HAZARD DATA
THRESHOLD LIMIT VALUE See Section II
EFFECTS OF OVEREXPOSURE KOH is caustic. Skin contact can cause burns. Eye contact may cause permanent injury.
EMERGENCY AND FIRST-AID PROCEDURES If leakage from battery contacts the skin, flush immediately with water. For eye contact, flush with copious amounts of water for 15 minutes and see physician at once.

SECTION VI - REACTIVITY DATA			
STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATIBILITY *(Materials to avoid)*			
HAZARDOUS DECOMPOSITION PRODUCTS When heated, battery may emit hazardous vapors of KOH & Hg			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES
STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Avoid skin and eye contact.
WASTE DISPOSAL METHOD Do not incinerate since battery may explode.

SECTION VIII - SPECIAL PROTECTION INFORMATION		
RESPIRATORY PROTECTION *(Specify type)*		
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER
PROTECTIVE GLOVES	EYE PROTECTION	
OTHER PROTECTIVE EQUIPMENT		

SECTION IX - SPECIAL PRECAUTIONS
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING When handling leaking batteries, use neoprene, rubber, or latex nitrile gloves. Store at room temperature and in a dry place.
OTHER PRECAUTIONS Install batteries in accordance with equipment instructions. Do not recharge or dispose of in fire. Replace all batteries in equipment at the same time. Do not mix battery systems of different types, such as alkaline and zinc carbon batteries. Do not carry batteries loose in your pocket or carrying bag. Check batteries periodically when in use.

Form OSHA-20
Rev. May 72

Student Supplement 1

MSDS 2

Mobil

621581

MOBIL MATERIAL SAFETY DATA BULLETIN

MOBIL OIL CORPORATION
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPT.

150 EAST 42ND STREET
NEW YORK, N.Y. 10017 (USA)

PRODUCT IDENTIFICATION

FLOWREX 100

SUPPLIER:
MOBIL OIL CORP.

CHEMICAL NAMES AND SYNONYMS:
PETROLEUM HYDROCARBONS

USE OR DESCRIPTION:
LUBRICATING OIL

HEALTH EMERGENCY TELEPHONE:
(212) 883-4411

TRANSPORT EMERGENCY TELEPHONE:
(800) 424-9300 (CHEMTREC)

OTHER DESIGNATION:
(TRN 621581)

TYPICAL CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE: ASTM 3.5 LIQUID	VISCOSITY: AT 100 F, SUS 110.0	AT 40 C, CS 20.0
ODOR: MILD	VISCOSITY: AT 210 F, SUS 38.0	AT 100 C, CS 3.7
RELATIVE DENSITY: 15/4 C 0.915	SOLUBILITY IN WATER: NEGLIGIBLE	PH: NA
MELTING POINT: F(C) NA	POUR POINT: F(C) 0(-18)	
BOILING POINT: F(C) >600(316)	FLASH POINT: F(C) (METHOD) >300(149) (ASTM D-92)	
VAPOR PRESSURE: MM HG 20C <.1		

NA=NOT APPLICABLE NE=NOT ESTABLISHED D=DECOMPOSES

INGREDIENTS

	WT PCT (APPROX)	TLV(TWA):	MG/M3	PPM
HAZARDOUS INGREDIENTS: NONE				
NON-HAZARDOUS INGREDIENTS: REFINED MINERAL OILS	100			

NOTE: TLVS SHOWN FOR GUIDANCE ONLY. FOLLOW APPLICABLE REGULATIONS

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Student Supplement 1

MSDS 2

Mobil

FLOWREX 100 621581

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: F(C) (METHOD) FLAMMABLE LIMITS: LEL UEL
>300(149) (ASTM D-92) .6 7.0

EXTINGUISHING MEDIA:
CARBON DIOXIDE, FOAM, DRY CHEMICAL AND WATER FOG.

SPECIAL FIRE-FIGHTING PROCEDURES:
FIREFIGHTERS MUST USE SELF-CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
NONE

HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: (IF ESTABLISHED)
5.00 MG/M3 SUGGESTED FOR OIL MIST

EFFECTS OF OVEREXPOSURE:
SLIGHT SKIN IRRITATION.

EMERGENCY AND FIRST-AID PROCEDURES

EYE CONTACT:
FLUSH WITH WATER.

SKIN CONTACT:
WASH CONTACT AREAS WITH SOAP AND WATER.

INHALATION:
NOT EXPECTED TO BE A PROBLEM.

INGESTION:
NOT EXPECTED TO BE A PROBLEM WHEN INGESTED. IF UNCOMFORTABLE, SEEK MEDICAL ASSISTANCE.

REACTIVITY DATA

STABILITY: (THERMAL, LIGHT, ETC.) CONDITIONS TO AVOID:
STABLE EXTREME HEAT

INCOMPATIBILITY: (MATERIALS TO AVOID)
STRONG OXIDIZERS

HAZARDOUS DECOMPOSITION PRODUCTS:
CARBON MONOXIDE

HAZARDOUS POLYMERIZATION: CONDITIONS TO AVOID:
WILL NOT OCCUR

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SPILL OR LEAK PROCEDURE

ENVIRONMENTAL IMPACT:
REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. U. S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. REPORT SPILL TO COAST GUARD TOLL-FREE NUMBER 800-424-3802.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
ABSORB ON FIRE-RETARDANT-TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SHOVEL UP AND DISPOSE OF AT AN APPROPRIATE WASTE-DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT APPLICABLE LAWS AND REGULATIONS AND WITH PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.

WASTE MANAGEMENT:
DISPOSE OF WASTE BY SUPERVISED INCINERATION IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

SPECIAL PROTECTION INFORMATION

EYE PROTECTION:
NO SPECIAL EQUIPMENT REQUIRED.

SKIN PROTECTION:
NO SPECIAL EQUIPMENT REQUIRED. HOWEVER, GOOD PERSONAL-HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.

RESPIRATORY PROTECTION:
NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

VENTILATION:
NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

OTHER:

SPECIAL PRECAUTIONS

HANDLING:
NO SPECIAL PRECAUTIONS REQUIRED.

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TOXICOLOGICAL DATA

ACUTE

ORAL TOXICITY: (RATS)
LD50: > 5 G/KG NONTOXIC (ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

DERMAL TOXICITY: (RABBITS)
LD50: > 2 G/KG NONTOXIC (ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

INHALATION TOXICITY: (RATS)
NOT APPLICABLE ---HARMFUL CONCENTRATIONS OF MISTS AND/OR VAPORS ARE UNLIKELY TO BE ENCOUNTERED THROUGH ANY CUSTOMARY OR REASONABLY FORESEEABLE HANDLING, USE, OR MISUSE OF THIS PRODUCT.

EYE IRRITATION: (RABBITS)
EXPECTED TO BE NON-IRRITATING. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

SKIN IRRITATION: (RABBITS)
MAY CAUSE SLIGHT IRRITATION ON PROLONGED OR REPEATED CONTACT. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

SUBACUTE AND MUTAGENICITY (SUMMARY)

CHRONIC OR SPECIALIZED (SUMMARY)

OTHER DATA

FILE CODES:
(FILL NO: TS0037002) MHC: 0* 0* NA 0* 1* PPEC: US82-249 APPROVE
3636
ENVIRONMENTAL AFFAIRS AND TOXICOLOGY DEPT. REVISED:
MANAGER OF PRODUCT SAFETY INFORMATION, PHONE: 212-883-4242 8/23/83

Student Supplement 1

MSDS 3

JCLE035 01/003/0020
CLEANER, GRAFFITI GEL
3-15-89

HAZARDOUS COMMUNICATION GUIDE

Material Safety Data Sheet

N/A = Not Applicable
N/D = No Data
N/E = Not Established

Supersedes: *10/20/86*

I. General Information

Date Revised: *12/9/88*

Chemical Name & Synonyms
N/A
Chemical Family
Engine degreaser (gelled)
Proper DOT Shipping Name
Consumer commodity 48580 Sub 3
Manufacturer
Crain Chemical Co., Inc.
Manufacturer's Address
P.O. Box 540995, Dallas, TX 75354

Trade Name & Synonyms
GEL GRAFFITI
Formula
N/A
DOT Hazard Classification
ORM-D
Manufacturer's Phone Number
214/358-3301
Chemtrec Phone Number
1-800-424-9300

II. Ingredients

Principal Hazardous Components	Percent	Threshold Limit Value (units) OSHA	ACGIH
Ethanol *CAS# 64-17-5*	*N/A*	*1000 ppm*	*1000 ppm*
Aromatic Hydrocarbon *CAS# 64742-06-9*	*N/A*	*100 ppm*	*100 ppm*
Chlorinated Hydrocarbon *CAS# 75-09-2*	*N/A*	*500 ppm*	*100 ppm*
Glycol Ethers *CAS# 111-76-2*	*N/A*	*50 ppm*	*25 ppm*

III. Physical Data

Boiling Point (°F)
N/A
Vapor Pressure (mm Hg.)
N/D
Vapor Density (Air = 1)
N/E
Solubility in Water
N/A
Appearance & Odor
Opaque, white gel/characteristic odor

Specific Gravity (H_2O = 1)
N/A
Percent Volatile By Volume (%)
77
Evaporation Rate (____ = 1)
N/A
pH
N/A

IV. Fire & Explosion Hazard Data

Flash Point (Test Method)
Flame projection 18" plus
Flammable Limits
Flammable
Extinguishing Media
CO_2, Foam
Special Fire-Fighting Procedures
Self-contained breathing apparatus

Auto Ignition Temperature
N/E
LEL
N/E
UEL
N/E

Unusual Fire & Explosion Hazards
Do not expose aerosols to temperatures above 130°F or the container may rupture.

Student Supplement 1

MSDS 3

JCLE035 01/003/0020

HAZARDOUS COMMUNICATION GUIDE

V. Health Hazard Data

Threshold Limit Value	OSHA Threshold Limit Value	ACGIH Threshold Limit Value
50 ppm	*See Section II*	*See Section II*

Carcinogen - NTP Program	Carcinogen - IARC Program
Chlorinated hydrocarbon (animal data only)	*Same as (NTP)*

Symptoms of Exposure

Headaches, dizziness, irritation, burning (eyes), nausea, asphyxia and possible chemical pneumonitis if aspirated into lungs.

Medical Conditions Aggravated by Exposure

May aggravate existing eye, skin, or upper respiratory conditions.

Primary Route(s) of Entry

Inhalation

Emergency First Aid

Eyes: Flush with water for 15 minutes. If irritated, see physician. Skin: Wash with soap and water. If irritated, see physician. Inhalation: Move to fresh air. Resuscitate if necessary. Get medical aid. Ingestion: Do NOT induce vomiting. Call physician immediately.

VI. Reactivity Data

Stability		Unstable	Conditions to Avoid: *Heat, sparks, welding arcs, open flames*
	X	Stable	
Incompatibility			Materials to Avoid: *Strong oxidizing agents*
Hazardous Polymerization		May Occur	Conditions to Avoid: *None known*
	X	Will Not Occur	

Hazardous Decomposition Products

CO_2, CO, HCl, Small amounts of phosgene and chlorine

VII. Environmental Protection Procedures

Spill Response

Absorb with suitable medium. Incinerate or land fill according to local, state, or federal regulations. Do not flush to sewer.

Waste Disposal Method

Aerosol cans, when vented to atmospheric pressure through normal use, pose no disposal hazards.

VIII. Special Protection Information

Eye Protection: *Safety glasses recommended*	Skin Protection: *Neoprene gloves recommended*
Respiratory Protection (Specific Type): *If vapor conc. exceeds TLV, use respirator approved by U.S. Bureau of Mines for organic vapor.*	Ventilation Recommended: *Adequate ventilation to keep vapor concentration below TLV.*
Other Protection: *None*	

Student Supplement 1

MSDS 3

JCLE035 01/003/0020

HAZARDOUS COMMUNICATION GUIDE

IX. Special Precautions

Hygienic Practices in Handling & Storage

Wash with soap and water before handling food. Do not puncture or incinerate containers. Do not store at temperatures above 130°F.

Precautions For Repair & Maintenance Of Contaminated Equipment

Remove all ignition sources i.e., heat, sparks, open flames, etc.

Other Precautions

Avoid food contamination. Keep out of reach of children. Remove ignition sources. Avoid breathing vapors.

Workplace Safety
Unit 2

Assignment Sheet 1—Interpret Material Safety Data Sheets

Name _____ Overall Rating _____

Evaluation criteria	Rating
Directions are followed	_____
All questions are answered correctly	_____

Directions: Use the MSDSs in Student Supplement 1 to answer the following questions. Write your answers on the blanks provided below each item.

MSDS 1—Duracell Alkaline Battery

1. What potentially hazardous materials are contained in this product?

_____

_____

2. What unusual fire and explosion hazards can occur with this product?

_____

_____

_____

3. What emergency and first-aid procedures should be taken if someone's skin or eye contacts leakage from this product?

_____

_____

_____

_____

_____

4. What precautions should be taken for disposal of this product?

_____

_____

_____

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Assignment Sheet 1

5. What precautions should be taken when handling and storing this product?

6. What other special precautions should be taken when working with this product?

MSDS 2—Mobil Lubricating Oil

1. What potentially hazardous materials are contained in this product?

2. What non-hazardous materials are contained in this product?

3. What effects result from overexposure to this product?

4. What emergency and first-aid procedures should be taken in each of the following situations?

   a. Eye contact

   b. Skin contact

Assignment Sheet 1

c. Inhalation

_____

_____

d. Ingestion

_____

_____

5. What materials should be avoided when using this product?

_____

6. What media should be used to extinguish fires involving this product?

_____

_____

7. What special procedures are required when fighting fires involving this product?

_____

_____

8. What procedures should be followed if this product is spilled?

_____

_____

_____

_____

_____

MSDS 3—Gel Graffiti®

1. What is this product used for?

_____

2. What are the principal hazardous ingredients in this product?

_____

Assignment Sheet 1

3. What does this product look like?

_____

4. What percentage of this product is volatile (capable of exploding)?

_____

5. What extinguishing agents should be used on fires created by this product?

_____

6. What may happen if aerosol containers of this product are exposed to temperatures higher than 130°F?

_____

7. What is the TLV for this product?

_____

8. Are any of the ingredients in this product suspected of causing cancer? Explain.

_____

_____

_____

9. What is the primary way in which this product enters the body?

_____

10. What are the symptoms of overexposure to this product?

_____

_____

_____

11. What first-aid measure should **not** be taken if this product is ingested?

_____

12. What conditions should be avoided when using this product?

_____

_____

Assignment Sheet 1

13. What materials should you avoid using with this product?

14. How should you respond to a spill of this product?

15. What special protective equipment and measures should you wear or take when using this product?

16. What special hygiene precautions should you take when using this product?

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Workplace Safety
Unit 2

Assignment Sheet 2—Compile a List of Hazardous Materials Found in Your Shop and Provide Additional Information on the Most Common Materials

Name _____ Overall Rating _____

Evaluation criteria	Rating
Directions are followed	_____
Materials are listed correctly	_____
Chart is completed correctly	_____

Directions: Make a list of the chemical names of all the hazardous materials found in your diesel technology shop. MSDSs should be available on all of these hazardous materials. Then complete the chart about the five most commonly used hazardous materials in your shop.

Hazardous Materials in Diesel Technology Shop (list all)

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____

Assignment Sheet 2

Most Common Hazardous Materials in Shop

	Chemical Name	How it is Used in Shop	PPE Required Before Using
1.			
2.			
3.			
4.			
5.			

Workplace Safety
Unit 2

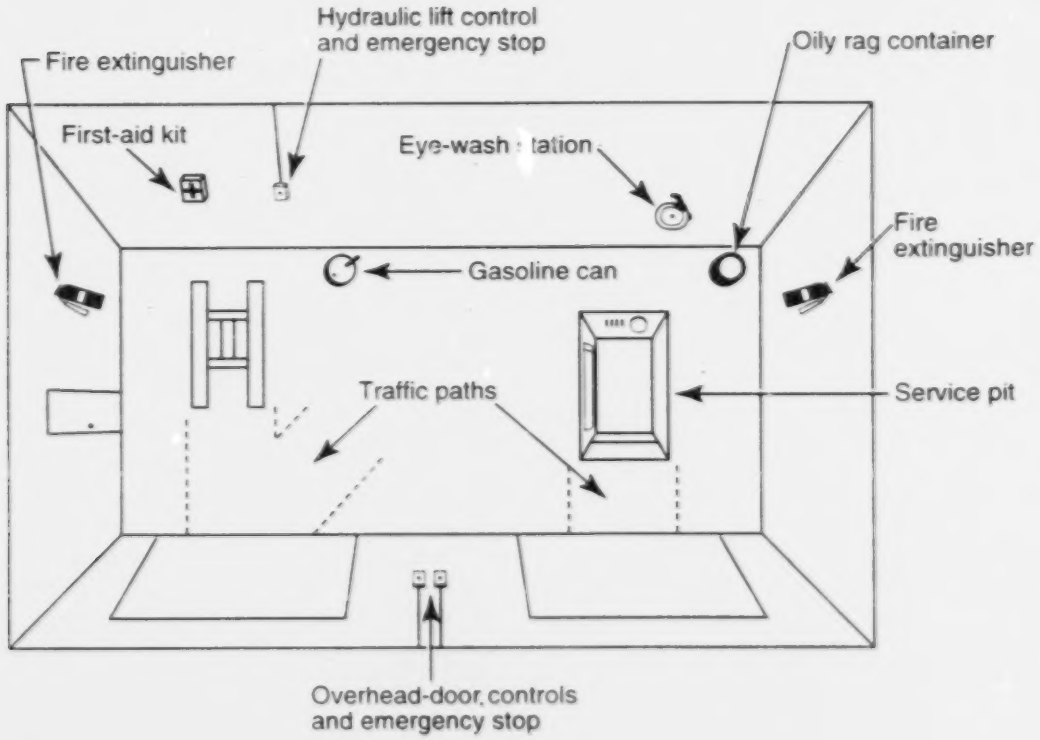
Assignment Sheet 3—Apply the Safety Color Codes to Diesel Technology Shops

Name _____ Overall Rating _____

Evaluation criteria	Rating
Directions are followed	_____
All items are correctly color-coded (Parts A & B)	_____
All shop items are included (Part B)	_____
Layout is neat and legible (Part B)	_____

PART A: Given Shop

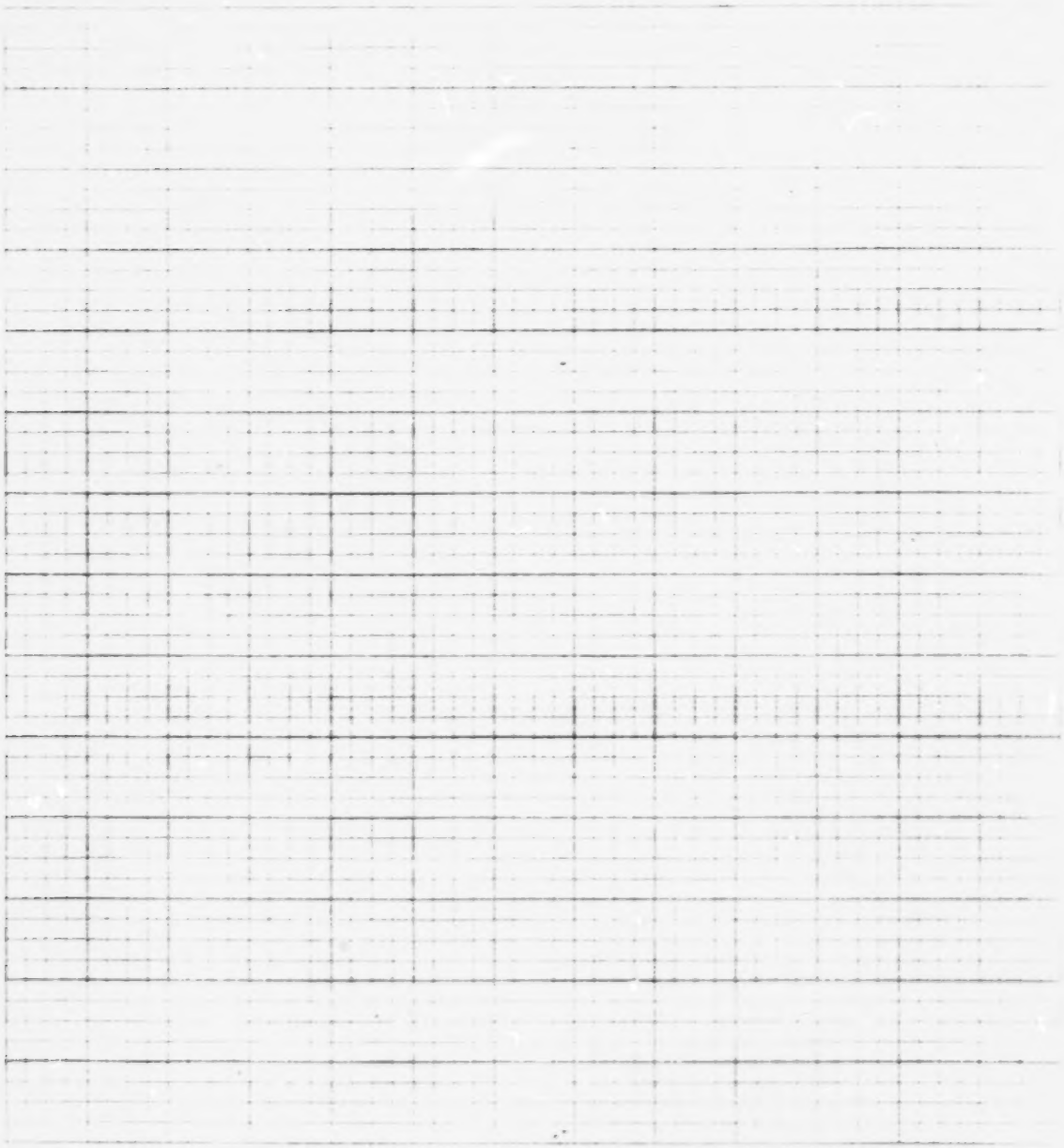
Directions: Look at the drawing below of a small diesel technology shop. A number of items that require federal safety color coding are labeled. Indicate what color the items should be either by writing in the correct color or by coloring it as it should be coded.



Assignment Sheet 3

Part B: School Shop

Directions: Draw a layout of your school shop below including all machines, workbenches, tools, first aid kit, and fire prevention equipment. Use the federal safety color code to identify equipment, hazards, safety features, and exposed parts that could cause accidents.



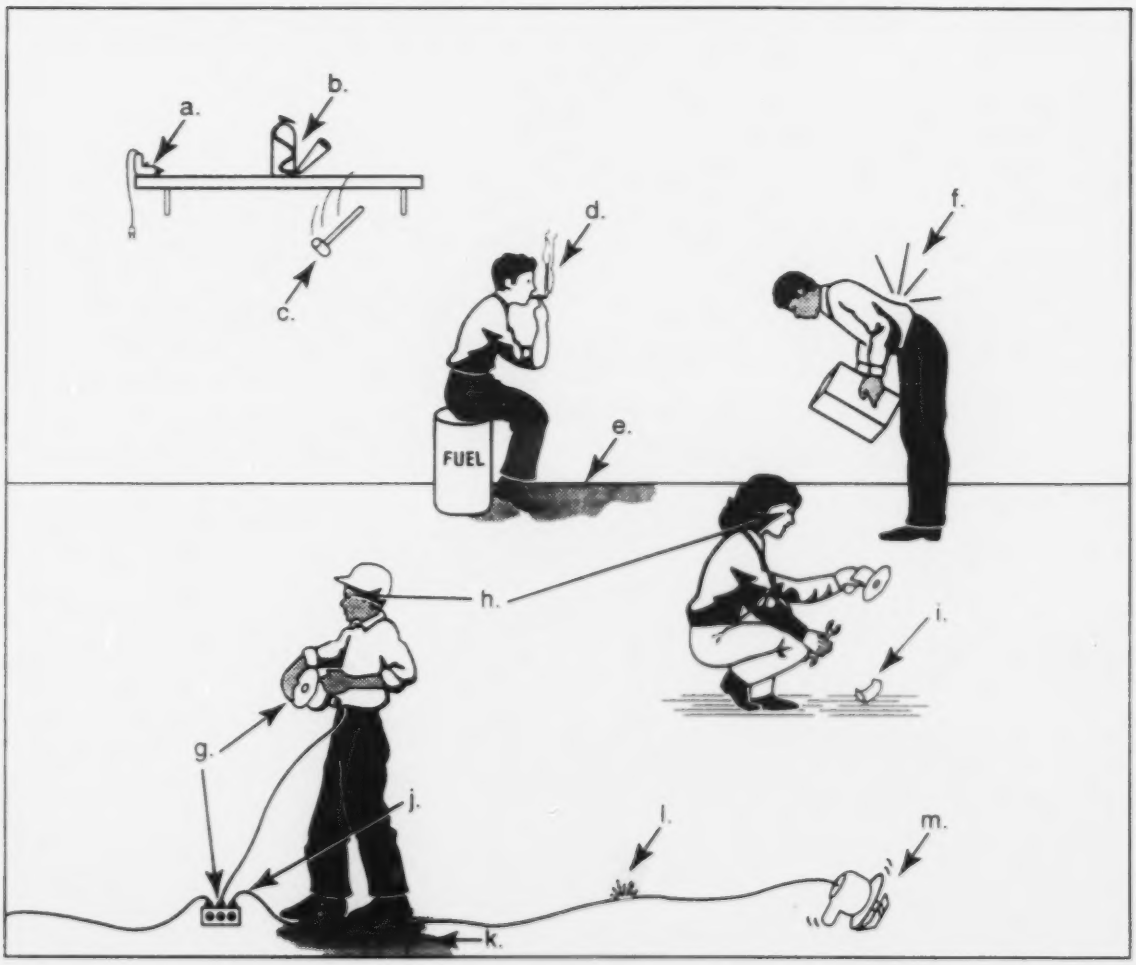
Workplace Safety
Unit 2

Assignment Sheet 4—Identify Workplace Safety Violations

Name _____ Overall Rating _____

Evaluation criteria	Rating
Directions are followed	_____
8 of 13 safety violations are correctly identified	_____

Directions: The following illustration of a diesel shop shows thirteen hazardous situations or dangerous practices. Identify at least eight of these safety violations and list them on the next page.



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Assignment Sheet 4

a. _____

b. _____

c. _____

d. _____

e. _____

f. _____

g. _____

h. _____

i. _____

j. _____

k. _____

l. _____

m. _____

Remember to identify at least 8.

Workplace Safety
Unit 2

Assignment Sheet 5—Complete an Individual Student Shop Safety Inspection

Name _____ Overall Rating _____

Evaluation criteria	Rating
All listed items are inspected correctly	_____
Recommendations are made for all unsatisfactory conditions	_____

Directions: Complete the safety inspection checklist by physically conducting an inspection of the shop area. Draw a circle around the appropriate letter, using the following letter scheme:

S — Satisfactory (needs no attention)
A — Acceptable (needs some attention)
U — Unsatisfactory (needs immediate attention)

Recommendations should be made in all cases where a "U" is circled. Space is provided at the end of the form for such comments.

A. GENERAL PHYSICAL CONDITION

S	A	U	1.	Machines, benches, and other equipment are arranged to conform to good safety practices.
S	A	U	2.	Stairways and ramps are clean and in good condition.
S	A	U	3.	Aisles are clear and in good condition.
S	A	U	4.	Floors are clean and in good condition.
S	A	U	5.	Walls, windows, and ceiling are clean and in good condition.
S	A	U	6.	Illumination is safe, sufficient, and well placed.
S	A	U	7.	Ventilation is adequate and proper for conditions.
S	A	U	8.	Room temperature is controlled and comfortable.
S	A	U	9.	Fire extinguishers are of proper type, adequately supplied, properly located, and properly charged.
S	A	U	10.	First aid kit is adequately supplied and properly located.
S	A	U	11.	Number and location of exits are adequate and properly identified.
S	A	U	12.	Safety rules are posted.
S	A	U	13.	Emergency numbers are posted by telephone.
S	A	U	14.	Walls are clear of objects that might fall.
S	A	U	15.	Utility lines are properly identified.
S	A	U	16.	Air in shop is free from excessive dust and smoke.
S	A	U	17.	Hazardous materials are clearly labeled.
S	A	U	18.	MSDSs are readily available for all hazardous materials in shop.
S	A	U	19.	Eyewash stations/showers are in or near the shop area for emergency first aid use.
S	A	U	20.	Evaluation for the overall rating of GENERAL PHYSICAL CONDITION

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Assignment Sheet 5

B. HOUSEKEEPING

S	A	U	1.	Storage space for tools and materials is adequate.
S	A	U	2.	Benches are kept orderly.
S	A	U	3.	Corners are clean and clear.
S	A	U	4.	Special tool racks, in orderly condition, are provided at benches and machines.
S	A	U	5.	Tool, supply, and/or material room is orderly.
S	A	U	6.	Sufficient scrap boxes and trash cans are provided.
S	A	U	7.	Materials are stored in an orderly and safe condition.
S	A	U	8.	Hazardous waste containers are closed and clearly identified.
S	A	U	9.	Hazardous waste is separated according to type.
S	A	U	10.	Hazardous materials have been stored in metal cabinets and locked from general access.
S	A	U	11.	Machines have been color coded.
S	A	U	12.	Safety storage cans are provided for flammable liquids.
S	A	U	13.	Floors are free of oil, water, and foreign material.
S	A	U	14.	Drain covers are securely in place.
S	A	U	15.	Evaluation for the overall rating for HOUSEKEEPING

C. EQUIPMENT

S	A	U	1.	Machines are arranged so that workers are protected from hazards of other machines and passing students.
S	A	U	2.	Danger zones are properly indicated and guarded.
S	A	U	3.	All gears and moving belts are protected by permanent enclosure guards.
S	A	U	4.	All equipment control switches are easily available to operator.
S	A	U	5.	Nonskid areas are provided around machines.
S	A	U	6.	Tools are kept sharp, clean, and in safe working order.
S	A	U	7.	Evaluation for the overall rating for EQUIPMENT

D. ELECTRICAL INSTALLATION

S	A	U	1.	All switches are enclosed.
S	A	U	2.	There is a master control switch for all of the electrical installations.
S	A	U	3.	All electrical extension cords are in safe condition and are not carrying excessive loads.
S	A	U	4.	All machine switches are within easy reach of the operators.
S	A	U	5.	Individual cut-off switches are provided for each machine.
S	A	U	6.	All electrical equipment is properly grounded.
S	A	U	7.	Ground fault interrupters are present and in working order.
S	A	U	8.	No temporary wiring is in evidence.
S	A	U	9.	Evaluation for the overall rating for ELECTRICAL INSTALLATION

Assignment Sheet 5

E. PERSONAL PROTECTION (Read only)

1. Safety glasses, goggles, or protective shields are provided and required for all work where eye hazards exist.
2. Shields and goggles are provided for welding.
3. Rings and other jewelry are removed by students when working in the shop.
4. Proper kind of wearing apparel is worn and worn properly for the job being done.
5. Leggings and safety shoes are worn in special classes.
6. Students are tested for safety knowledge ability.
7. Sleeves are rolled above elbows when operating machines.
8. Student's loose clothing such as ties, scarves, and loose sleeves are secured.

Recommendations for Improving Unsatisfactory Conditions

First Aid
Unit 3

Objective Sheet

Unit Objective

After completing this unit, the student should be able to describe the steps for giving first aid and determine the basic first aid measures for given emergency situations. The student should demonstrate these competencies by completing the assignment sheet and by scoring a minimum of 85 percent on the written test.

Specific Objectives

After completing this unit, the student should be able to:

1. Match terms related to first aid with their correct definitions.
2. List major causes of accidents.
3. State injuries that may occur in the diesel shop according to their sources of accidents.
4. Match basic types of accident injuries with the correct descriptions.
5. Describe in the correct order the steps for giving first aid.
6. List times to call for emergency medical service.
7. Select from a list the information to give during an emergency phone call.
8. Select true statements concerning legal aspects of first aid.
9. Match the contents of a first aid box with the correct uses.
10. Complete statements concerning bloodborne pathogens and special first aid precautions.
11. Complete statements concerning basic first aid procedures for various emergencies.
12. Arrange in order the steps on how to treat choking.
13. Complete statements concerning guidelines for giving mouth-to-mouth breathing.
14. Complete statements on the basic steps for performing cardiopulmonary resuscitation.
15. Determine basic first aid measures for given emergency situations. (Assignment Sheet 1)

First Aid
Unit 3

Information Sheet

1. Terms and definitions

a. **Accident**—Suddenly occurring, unintentional event that causes injury or property damage

b. **Acquired immune deficiency syndrome (AIDS)**—Life-threatening bloodborne disease that depresses the immune system; caused by the human immunodeficiency virus (HIV); is eventually fatal

c. **Airway obstruction**—Blockage of the airway that prevents air from reaching a person's lungs

d. **Anaphylactic shock**—Severe and sometimes fatal reaction to a substance such as a food, drug, or insect venom; characterized by respiratory distress, fainting, and itching

e. **Antiseptic**—Substance that blocks or slows the growth of certain microorganisms but does not kill them

f. **Arteries**—Blood vessels that carry oxygen-rich blood from the heart to all parts of the body

g. **Bloodborne pathogen**—Disease-causing microorganism found in infected blood and blood products

h. **Cardiopulmonary resuscitation (CPR)**—Technique used to restore circulation and breathing for a victim whose breathing and heart have stopped; combines chest compressions (cardio-) and mouth-to-mouth breathing (pulmonary)

i. **Carotid arteries**—Major blood vessels that supply blood to the head and neck

Note: Blockages in these arteries cause strokes. These are the arteries commonly felt for when taking a pulse.

j. **Choking**—Blockage of the airway by food, fluids, or other foreign objects

k. **Consent**—Permission to provide care, given by the victim to the rescuer

l. **Coronary arteries**—Blood vessels that supply the heart muscle with oxygen-rich blood

Note: Blockages in these arteries cause heart attacks or cardiac arrests.

m. **Diabetes**—Condition in which the body does not produce enough insulin

n. **Emergency medical service (EMS)**—Trained and equipped personnel dispatched through a local emergency number to provide emergency care for ill or injured people

o. **Epilepsy**—Chronic condition characterized by seizures that vary in type and duration; can usually be controlled by medication

Information Sheet

p. **First aid**—Immediate care given to a victim of injury or sudden illness until more advanced care can be obtained

q. **Heimlich maneuver**—Procedure for forcing a foreign object from the airway of a choking victim

r. **Hepatitis**—Infectious disease marked by inflammation of the liver; several types; severe cases may be fatal

s. **Injury**—Condition that occurs when the body is subjected to an external force

t. **Medical emergency**—Sudden illness requiring immediate medical attention

Examples: Heart attack, stroke, diabetic coma, epileptic seizure

u. **Pressure points**—Sites on the body where pressure can be applied to major arteries to slow the flow of blood to a body part

v. **Pulse**—Beat felt in arteries with each contraction of the heart

w. **Trauma**—Wound or injury caused by violence or excessive physical force

x. **Unconsciousness**—State in which a person experiences no sensory impressions

Note: A victim who is unconscious may look asleep but you cannot awaken them.

y. **Veins**—Blood vessels that carry oxygen-poor (dark red) blood from all parts of the body back to the heart

2. Major causes of accidents

a. **Unsafe acts**

Figure 1

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Information Sheet

1) Cleaning, oiling, adjusting, or repairing of moving, energized, or pressurized equipment

2) Failure to receive proper instruction

3) Failure to use personal protective equipment

4) Failure to secure area or warn others of danger

5) Horseplay, quarreling, or fighting

6) Ignoring instructions or operating without permission or authority

7) Improper use of equipment

8) Improper use of hands or body parts

9) Inattention to footing or surroundings

10) Operating or working at unsafe speed

11) Removing safety devices

12) Using unsafe equipment

b **Unsafe personal factors**

Figure 2

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1) Being under the influence of alcohol/drugs

2) Fatigue

3) Illness

4) Improper attitude

5) Lack of job knowledge or skill

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c. **Unsafe conditions**

Figure 3

1) Defective tools, equipment, substances

2) Dress or apparel hazard

3) Environmental hazards such as temperature extremes or contaminated air

4) Hazardous methods or procedures

5) Inadequately guarded machines or area

6) Improper illumination

7) Improper storage of hazardous and flammable materials

8) Poor housekeeping

Note: 98% of all accidents and injuries are caused by one or a combination of these causes. Only 2% of accidents are attributed to unpreventable acts of nature.

3. Sources of accidents in the diesel shop and injuries that may occur

a. Horseplay—May cause others to fall against sharp objects or moving machinery

b. Air hose—One blast may rip clothing or skin

c. Grinder—May cause eye or face injury from flying sparks or metal chips

d. Batteries—May explode when near open flame or electrical spark

e. Moving parts—May catch fingers or clothing

Information Sheet

f. Loose clothing—May catch in rotating parts

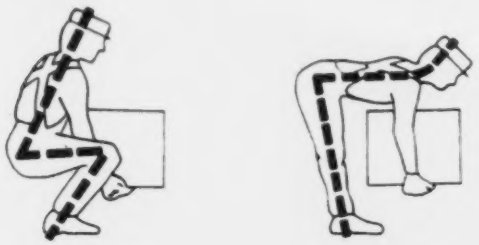
g. Tools—Sharp edges may puncture skin

h. Electrical power tools—May cause shock if not grounded

i. Lack of or improper supporting device under heavy objects—A fall may cause a fatal injury.

j. Lifting heavy objects—May cause severe back injury

Figure 4



Lift this way Not this way

k. Welding—May cause injury to eyes and to skin if protective equipment is not worn

l. Pneumatic tools—High air pressure may seriously damage eyes and skin.

m. Spills on the floor—May cause falls

Figure 5

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4. **Basic types of accident injuries**

   a. **Amputation**—Loss of an arm or leg

   b. **Burn**—Tissue damage caused by fire or heat (thermal), chemicals, electricity, or certain radiations

   c. **Contusion, bruise**—Tissue damage caused by force (blunt trauma); broken blood vessels under the skin cause discoloration (black or blue)

   d. **Dislocation**—Displacement of a bone at a joint

   e. **Electric shock, electrocution**—Nerve and muscle damage caused by electricity traveling through the body; may cause burns and death (electrocution) if the heart is stopped by the electricity

   f. **Exposure to severe weather (frostbite, heat stroke, heat exhaustion, sunstroke)**—Various types of damage to the body caused by extremely high or low temperatures; victim may be unconscious

   g. **Foreign body**—Entrance of an abnormal substance into the body

      Examples: Dust particles in the eye, rust fragments under the skin, debris in an open wound

   h. **Fracture**—Broken bone; may be closed (below the skin) or open (protruding through the skin)

   i. **Internal injury**—Damage to abdominal or pelvic body organs, usually caused by force

   j. **Open wound (cut, laceration, puncture, abrasion)**—Break in the skin's surface, usually with bleeding involved

   k. **Sprain, strain**—Twisting or wrenching of a joint (sprain) or a muscle (strain), usually with ligament damage also involved

5. **Steps for giving first aid** (listed in order)

   a. **Primary steps of first aid**

      Note: These are the steps you should do <u>first</u> when you find someone who is seriously injured or sick.

      1) **Make sure the victim is in a safe place.** Never move victims unless they are in danger where they are such as from fire, traffic, or dangerous fumes. You can hurt victims even more by moving them.

         Note: There may also be dangers present that will prevent you from helping the victim such as downed power lines or deep or swift-moving water. Call emergency medical services if you cannot help.

      2) **Check the victim's breathing.** Check the airway to see if it is clear. If the victim is not breathing, give mouth-to-mouth breathing.

Information Sheet

3) **Check the victim's circulation.** Check their pulse on the wrist or on the carotid artery (side of the neck) to see if their heart is still beating. If their heart has stopped, begin CPR if you are trained.

4) **Stop any severe bleeding.** Put on your first aid gloves, and then apply pressure to the wound or to a pressure point.

Note: These four steps can help save a life. Now go on to the secondary steps to help prevent further injury.

b. **Secondary steps of first aid**

1) **Call for emergency medical help or have someone else make the call.** Emergency numbers should be posted by the phone or listed in the front of the phone book. 911 is used in many cities. Also call for your instructor or supervisor.

2) **Always have a reason for what you do.** Never try to do anything you have not been trained to do. Be sure that what you are doing will help and not hurt the victim.

3) **Stay calm. Talk to the victim.** You want to reassure the victim that someone knows they are hurt and that something is being done.

4) **Ask the victim what happened and where he/she is hurt.** If the victim is unconscious but breathing, begin to check from head to toe for injuries.

5) **Check for a medical alert bracelet, necklace, or wallet card.** This may be worn by someone with a serious medical condition such as epilepsy, diabetes, heart disease, or allergies.

6) **Take care of other injuries** (broken bones, burns, cuts, etc.)

Note: First aid is only intended to help until a doctor or other trained person can take over.

6. **Times to call for emergency medical service (EMS)**

—When the victim:

a. Is unconscious, unusually confused, or seems to be losing consciousness

b. Has trouble breathing, is breathing in a strange way, or is not breathing

c. Has persistent chest pain or pressure

d. Has pressure or pain in the abdomen that does not go away

e. Is vomiting or passing blood

f. Has seizures, severe headache, or slurred speech

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g. Appears to have been poisoned

h. Has injuries to the head, neck, or back

Note: It's better to be safe than sorry. If you are not sure how serious the injury is or do not know what to do, call for emergency help.

7. Information to give during an emergency phone call

Note: Speak slowly and clearly. Shouting is difficult to understand.

a. What happened—Tell the nature of the emergency.

Examples: Man is bleeding severely, woman has fallen off a ladder and is unconscious, man is having a heart attack, woman has a chemical burn, etc.

b. How many are involved—This tells them how many rescue squads to send.

c. Where victim is located—Give city, street name, street number, description of building, whatever will help find the victim.

d. What help (first aid) is being given

e. Your name

f. Phone number where you are calling from

g. Do not hang up until the dispatcher hangs up—The emergency dispatcher may have other questions or be able to give you advice or instructions on what to do.

8. Legal aspects of first aid

a. Under most situations, you are not **legally** obligated to give first aid.

b. However, once you start first aid, you cannot stop until you can turn over their care to others of equal or greater competence such as trained medical emergency workers or experienced supervisors or co-workers or until the victim refuses treatment.

c. You must tell the victim who you are, how much training you have, and how you plan to help.

d. Consent should be obtained from every conscious, mentally competent adult. Oral consent is valid.

e. Consent should be obtained from the parent or guardian of a child or mentally incompetent adult.

f. Do not give first aid if the victim refuses to consent.

g. Consent is implied for giving emergency life-saving first aid to an unconscious victim.

Information Sheet

h. Good Samaritan laws protect first aiders in most states if you are acting in good faith and without gross negligence or willful misconduct.

Note: You cannot force first aid on anyone. A police officer is the only person with the authority to restrain and transport a person against the person's will. Even at the hospital, the victim will have to give permission for medical care.

9. Contents of a first aid box (or kit)

a. Adhesive bandages (such as Band-Aids®), various sizes—Used for covering small wounds

b. Adhesive tape, roll—Used for securing the dressing or bandage

c. Alcohol or antiseptic wipes—Used to cleanse a wound area or your hands

d. Antiseptic skin ointment—Used to prevent infection, especially for minor cuts

e. Face shield or mask—Used to act as a barrier between the victim and the first aider when giving mouth-to-mouth breathing

f. Gauze bandage, roll—Used for wrapping around a wound or for holding a larger dressing on the wound area

g. Gauze dressings or pads, individually wrapped—Used for cleaning and covering wounds

h. Gloves, disposable (latex or vinyl)—Used to act as a barrier between the victim and the first aider when blood and body fluids are present

i. Scissors—Used to cut bandages and tape

j. Tweezers—Used to remove splinters or insect stingers

Note: Other items may be included such as cold packs and elastic bandages. A basic first aid guide book is also helpful.

10. Bloodborne pathogens and special first aid precautions

a. In any situation involving blood or body fluids, there is a small, but real, risk of infection from very serious bloodborne pathogens.

b. Bloodborne pathogens are disease-causing microorganisms carried in the blood. These include:

1) HIV (human immunodeficiency virus), which eventually develops into AIDS (acquired immune deficiency syndrome), a fatal disease, and

2) Hepatitis B (HBV), a virus that causes serious and sometimes fatal liver disease.

c. Special precautions must be followed to protect you when giving first aid.

1) Treat all victims as if they were infected because you cannot tell by looking at someone if they are infected with HIV or HBV.

2) Always wear latex or vinyl rubber gloves as a barrier. These should be included in every first aid kit. If latex gloves are not available, use the most waterproof material available (such as plastic bags) or extra gauze dressings to form a barrier.

3) Cover all wounds with dressings to prevent both the victim and the first aider from coming in contact with each other's blood.

4) Use face masks with a one-way valve for protection when doing mouth-to-mouth breathing, especially if there is blood in the mouth. Every first aid kit should have one.

5) Do not eat, drink, or touch your mouth, nose, or eyes when giving first aid.

d. Special clean-up procedures must also be followed.

1) Vigorously wash your skin in hot, soapy water, and rinse well.

2) Notify designated personnel in your facility to clean up any materials or surfaces contaminated by blood or body fluids. They will:

- Wash all clothing and other items contaminated by blood or body fluids in hot, soapy water.
- Wash floors and other blood-contaminated surfaces with a solution of one part liquid chlorine bleach to nine parts of water, and rinse well.
- Dispose of cleanup materials properly in plastic biohazard bags.

Note: If you have other questions, call the national AIDS hot line at 1-800-342-AIDS.

11. Basic first aid procedures for various emergencies

Note: These are the specific things you can do while you are waiting for emergency help. Keep in mind the basic first aid procedures as well.

a. **Bleeding**

1) Minor bleeding

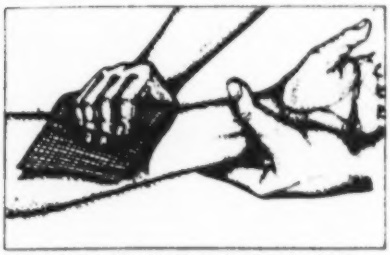
- Apply antiseptic solution.
- Dress with sterile bandages.

Information Sheet

2) Severe bleeding

- Apply pressure dressing or manual pressure to wound.

Figure 6



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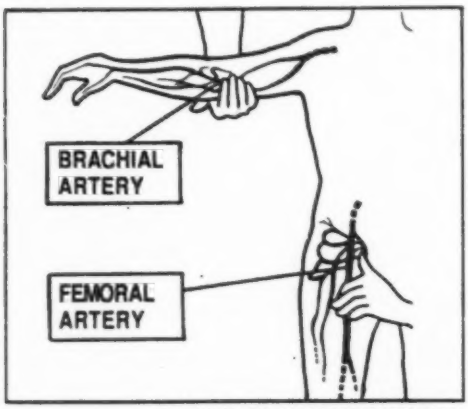
- If bleeding still does not stop, apply pressure to appropriate pressure points—Brachial arteries for arms and hands, femoral arteries for legs and feet

Figure 7



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- Watch for signs of shock. Treat as necessary. (see shock)

b. **Broken bones**

1) Open fractures (bone has broken through the skin surface)

- Control bleeding.
- Cover bone and wound with a dressing.
- Do not try to push the bone back into place.
- Do not try to clean the cut.

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- Do not move the victim. If the victim must be moved, splints should be applied from the joint above to the joint below the break.

Figure 8

A splint should extend above and below the injured area, to the nearest joint.

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2) Closed fracture (bone has not broken skin surface)

- Check for swelling, deformity, pain/tenderness, loss of use, or grating sensation. These are indications of fractures.
- Immobilize the break using splints, slings, or wraps.
- Do not move the victim.

3) Spinal injuries (neck or back),

- Do not move the victim.
- Do not let the victim try to move.
- Call for help immediately.

Figure 9

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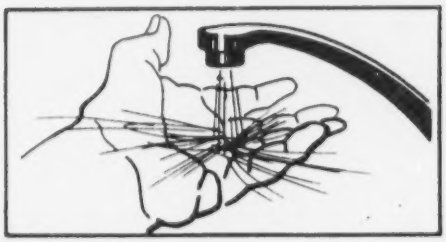
Information Sheet

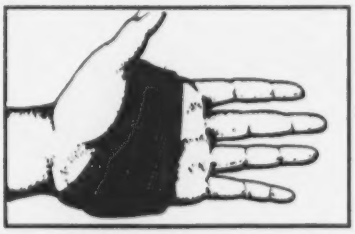
c. **Burns**

1) First-degree thermal burn—Burn affecting only the outer skin layers; characterized by redness and pain

- Hold under cold water.
- Apply dry, sterile dressing.

Figure 10





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2) Second-degree thermal burn—Burn penetrating beneath the superficial skin layers; characterized by swelling and blisters

- Cool with a damp compress.
- Cover with a dry, sterile dressing to prevent infection.
- Do not break blisters.

3) Third-degree thermal burn—Burn that destroys all skin layers and underlying tissue; characterized by white, leathery appearance and lack of pain

- Cool with a damp compress.
- Cover with a dry, sterile dressing.
- Cover victim with a blanket to prevent loss of body heat.
- Do not put oil, butter, ointments, or any kind of medicine on a serious burn.

  Note: These will have to be scraped off at the hospital and may cause further complications.

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4) Chemical burn

- Flush skin thoroughly with clean water.
- Check MSDS for more first aid instructions.
- Apply dry, sterile dressing.

5) Electrical burn

- Locate both the entrance and exit burns.
- Treat as for a third-degree burn.

d. **Convulsion** (including epileptic seizure)

Note: A convulsion may occur at the onset of a serious infectious disease or because of a head injury, brain disease, or epilepsy.

1) Help victim lie on the ground or floor if possible.

2) Clear area of hard or dangerous objects to protect the victim from self-injury.

3) Turn victim to the side to allow saliva to drain from the mouth.

4) Give mouth-to-mouth breathing if necessary.

5) Do not try to restrain victim.

6) Do not place a blunt object between the victim's teeth.

7) Do not pour liquids into victim's mouth.

e. **Electrical accident**

1) Do **not** provide any medical assistance until all electrical current has been shut off.

> **Caution: If the victim is still in contact with a live electrical hazard, do not endanger yourself by touching the victim, metal objects, water, or the wet ground. You may become a victim yourself as the current passes into your body.**

2) Check breathing and pulse. Perform mouth-to-mouth breathing or CPR if necessary and if qualified.

3) Watch for signs of traumatic shock. Treat as necessary. (See shock)

4) Check for signs of electrical burns at entrance wound and exit wound. Treat as necessary. (See burns)

Information Sheet

f. **Eye injury**

1) Minor

- Have the victim close his/her eyes, and put a piece of moist cotton over the closed lid.
- Place a bandage over the cotton.

2) More severe injury

- Have the victim close his/her eyes, and apply a sterile dressing.
- Place a loose bandage over the dressing.
- Do not allow the victim to rub his/her eye.

Note: Even though damage may be confined to one eye, it is sometimes best to bandage both eyes with a sterile dressing so the victim will not have a tendency to move the damaged eye.

3) Chemical injury—Flush eyes immediately at an eye-flushing station, or use a bottled, portable flushing solution.

Figure 11

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g. **Falls**

1) Head injury

- Lay victim flat.
- Check breathing and pulse. Perform mouth-to-mouth breathing or CPR if necessary and if qualified.
- Control bleeding.

2) Less severe falls

- Check for injury and provide first aid as appropriate.
- Do not move victim or allow victim to move if a neck or back injury is suspected.

Information Sheet

h. **Heart attack**

1) Recognize the signs and symptoms of heart attack:

- Chest pain (most common symptom) that may radiate to the arms, neck, jaw, and upper back
- Profuse sweating and chills
- Nausea, vomiting, indigestion
- Difficulty and pain in breathing
- Weakness
- Apprehension
- Pale or blue-looking skin, lips, or nails

2) Help victim to a less painful position.

3) Loosen victim's clothing around the neck and midriff (abdomen).

4) Check breathing and pulse. Perform CPR if necessary and if qualified.

i. **Heat exhaustion**

1) Recognize the signs and symptoms of heat exhaustion:

- Approximately normal body temperature
- Profuse perspiration
- Pale, clammy skin
- Rapid, weak pulse
- Rapid, shallow breathing

2) Move victim to a cool place.

3) Have victim lie on back.

4) Elevate victim's feet slightly (8 - 12").

5) Loosen victim's clothes.

6) Sponge victim with cool water.

7) Give cool water to drink.

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j. **Heat stroke**

1) Recognize the signs and symptoms of heat stroke:

- High body temperature (105°F or higher)
- Little or no perspiration
- Red skin
- Rapid pulse
- Rapid, shallow breathing
- May be unconscious

2) Move victim to a cool location.

3) Cool victim as quickly as possible. Remove victim's outer clothing and sponge bare skin with cool water or rubbing alcohol.

4) Place cold packs at neck, armpits, head, and groin.

5) Use fans for additional cooling.

6) Give cool water to drink, if conscious.

k. **Insect bites/stings** (from bees, wasps, spiders, etc.)

1) Ordinary reaction

- Scrape stinger sideways away from wound or remove with tweezers.
- Wash wound with soap and water.
- Apply cold pack (or ice) to reduce swelling.

2) Allergic reaction

Note: A victim with an allergic reaction to the insect poison may suffer anaphylactic shock and needs prompt treatment with epinephrine by injection or inhalation.

- If possible, immediately transport victim to a hospital or doctor's office.
- If not possible, call for emergency medical help.
- While waiting for help:
  - — Lay victim down or help the victim to a position in which he or she can breathe more easily.
  - — Elevate victim's legs if possible.

— Remove the stinger and perform first aid actions as for an ordinary sting.
— Check breathing and pulse. Perform mouth-to-mouth breathing or CPR if necessary and if qualified.

I. **Shock, traumatic**

Note: Shock may occur with any type of injury. Even though the injury itself may not be serious enough to cause death, death may occur from shock resulting from an injury.

1) Recognize the signs and symptoms of shock:

- Damp (clammy), very cold, pale skin
- Fast, weak, uneven pulse
- Fast, shallow, uneven breathing
- Weakness
- Thirst
- May be unconscious

2) Lay victim down on his/her back (preferred) or side if vomiting occurs.

3) Elevate victim's legs slightly (8 - 12") if there are no neck, back, or hip injuries.

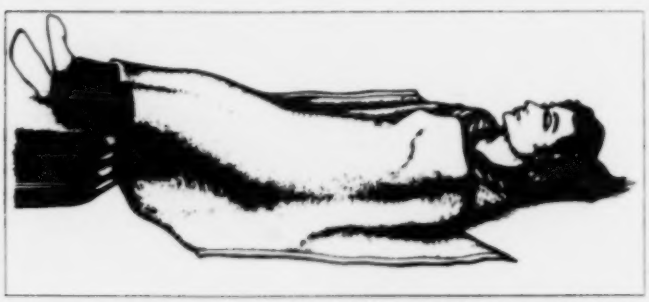
4) Cover to prevent loss of body heat.

5) Make sure victim's clothes are loose. Loosen or cut if necessary.

6) Do not give fluids unless victim is fully conscious and medical care will be delayed a long time.

Note: Fluids may cause vomiting.

Figure 12



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12. How to treat choking

Note: A person who is choking may have either a complete or a partial airway obstruction. A person with a complete air obstruction cannot speak, breathe, or cough and needs immediate help! With a partial obstruction, the person may be able to cough up whatever is causing the obstruction such as a piece of food. If they cannot clear the obstruction with coughing, they too will need emergency help.

a. Ask the victim, "Are you choking?"

Note: The universal sign for choking is when the victim grabs his/her throat.

b. If the victim cannot speak, stand directly behind him/her so you can begin to administer abdominal thrusts using the Heimlich maneuver.

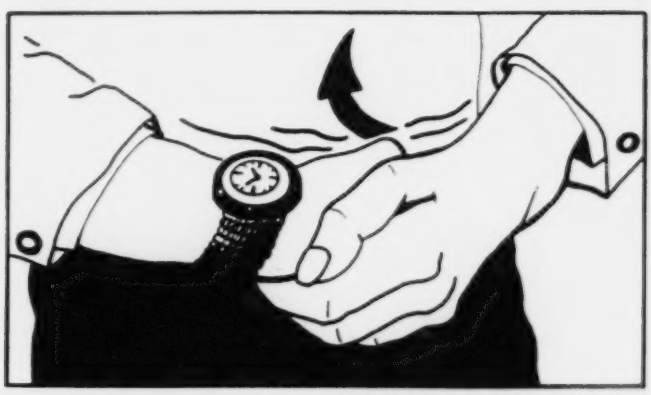
c. Wrap your arms around the victim's waist, and place your finger on their belly button.

d. Make a fist of the other hand, and put the thumb side of the fist just above your finger on the belly button (and below the ribs).

e. Take your finger off their belly button, and place this hand over your fist.

f. Give quick, upward thrusts into the abdomen. This forces air trapped in the lungs to push the object out of the airway.

Figure 13



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g. Repeat the thrusts until they work or until trained help comes.

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13. Guidelines for giving mouth-to-mouth breathing (artificial respiration)

Note: A person may stop breathing because of drowning, poisoning, heart attack, choking, or electric shock.

a. Check to see if victim is conscious or unconscious. Tap on his/her shoulder and shout out loud, "Are you OK?"

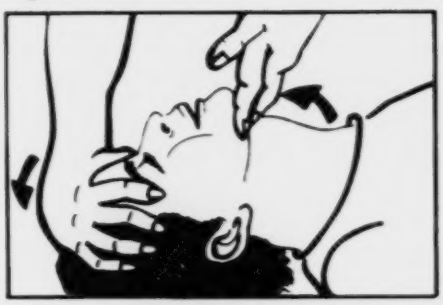
   1) If the person responds (conscious), begin a secondary survey.

   2) If the person does not respond (unconscious), call for emergency help (or send someone else to call), and go to next step.

b. Roll the victim so he/she is lying on their back. Try to roll him/her over all at once. Keep the neck and back straight.

c. Tilt the victim's head back and lift his/her chin so it is pointing straight up in order to make the airway straighter and more open.

Figure 14



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d. Check victim's breathing for five seconds to see if he/she is breathing. Watch the victim's chest to see if it moves up and down, and listen with your ear near the victim's mouth. You should feel their breath on your cheek.

   - If the person is breathing, they do not need mouth-to-mouth breathing. Watch them and wait for help.

   - If the person is not breathing, go to next step.

Information Sheet

e. Pinch the victim's nose shut, put your mouth tightly over the victim's mouth, and gently give two breaths into the victim's mouth, each lasting about 1½ seconds.

Figure 15

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f. Check the victim's chest to make sure it rises and falls with each breath. If it does not rise and fall, then the air is not getting in. Check the airway for obstructions and give abdominal thrusts (Heimlich) to force out the obstruction.

g. Check the victim's pulse by placing your fingers flat against the side of the neck (in the crease of the neck).

1) If the person has a pulse but is not breathing, continue the mouth-to-mouth breathing.

2) If the person has no pulse and is not breathing, perform CPR if trained.

h. Continue to give breaths with four-second waits between breaths until the victim starts to breathe or until trained help comes.

Note: If the victim is a child, you will need to seal off both the child's mouth and nose. Also use less force on the breaths you give.

14. Basic steps for performing cardiopulmonary resuscitation (CPR)

Note: This written material alone will not give you enough information or experience to perform CPR, but you will have a basic understanding of how it is done. To gain the skills of CPR, it is necessary to practice on manikins, with certified instructors as guides. Contact your local hospital or American Red Cross for more information about classes.

a. Check victim's pulse and breathing, and call for emergency help.

Note: Information on how to do this was given with the guidelines for mouth-to-mouth breathing, Objective 13.

1) If victim has a pulse but is not breathing, give mouth-to-mouth breathing. No CPR is needed.

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2) If the person has no pulse and is not breathing, go to the next step to begin CPR.

Note: CPR consists of cycles of chest compressions and mouth-to-mouth breathing.

b. Position hand correctly on the victim's chest.

1) Find the notch where the lower ribs meet the breastbone.

2) Place the heel of your hand on the breastbone, next to this notch area.

3) Place your other hand on top of the first.

Figure 16

c. Position yourself kneeling next to the victim with your shoulders directly over your hands, with your elbows locked.

d. Compress the chest by pressing down 1½ - 2". Then release. Push with the weight of your upper body.

e. Keep a steady down-and-up rhythm, and don't pause between compressions. Count "one and two and three and four and five and six and ..." to establish a smooth, steady rhythm.

f. Give 15 compressions, then give 2 slow breaths. This cycle of 15 compressions and 2 breaths takes about 15 seconds total.

g. Give 4 continuous cycles of CPR, and then check pulse.

1) If there is a pulse, check victim's breathing. If he/she is still not breathing, continue mouth-to-mouth breathing but discontinue chest compressions.

2) If there is still no pulse, continue giving CPR in cycles of 15 compressions and 2 breaths with pulse checks every 4 cycles.

Note: Do not stop CPR unless another trained person or emergency personnel can take over or the victim's pulse and breathing return. Most victim's hearts will not start without electrical stimulation which can only be administered by medical personnel. However, your efforts are critical for keeping oxygen circulating to their brain until medical help arrives.

First Aid
Unit 3

Assignment Sheet 1—Determine Basic First Aid Measures for Given Emergency Situations

Name _____ Overall Rating _____

Evaluation criteria	Rating
Directions are followed	_____
Discussions reflect good knowledge of basic first aid measures	_____

Directions: Read the accident scenarios below and write the emergency and first aid actions you would take.

1. One hot day while working in a tightly closed shop, co-worker Jane tells you that she feels dizzy and has a headache. She suddenly faints. Her skin is red, very hot, and dry. What emergency and first aid measures should you take?

Assignment Sheet 1

2. Co-worker Gary has been splattered with gasoline, and he was burned when the gasoline caught fire. The resulting burn is deep with a lot of tissue damage. Gary does not feel much pain. What emergency and first aid measures should you take?

3. A customer was walking by some parts being uncrated when she stepped on a nail. The nail penetrated her shoe and entered her foot. There is minimal bleeding. However, she begins to complain of feeling queasy. You notice that her face is pale and her skin feels cool and clammy. Her breathing is rapid, shallow, and irregular. After a moment, she says she feels weak and wants to rest. What emergency and first aid measures should you take?

Assignment Sheet 1

4. Co-worker Robert was plugging a battery charger into an extension cord in the wash bay area of the shop. There was a popping sound and a puff of smoke. He screamed, fell over, and lay motionless on the floor. What emergency and first aid measures should you take?

5. Supervisor Susan is carrying a battery when she slips and falls. She hits the workbench with her head as she falls. Her head is cut and bleeding heavily. What emergency and first aid measures should you take?

Assignment Sheet 1

6. During lunch, co-worker Ted begins to cough and then to choke. When you see him, he's not coughing anymore and he can't talk or breathe. What emergency and first aid measures should you take?

7. Co-worker Lisa cuts her hand on a piece of glass. She says, "It's nothing. Don't worry about me." What emergency and first aid measures should you take?

Assignment Sheet 1

8. Co-worker Todd got dirt and other debris in his eye when he was removing a part from a truck he was working on. He's rubbing his eye, but this seems to be making it worse. What emergency and first aid measures should you take?

9. Co-worker Angela slipped and fell from a ladder. She landed on her left arm. She says that arm really hurts and she's afraid to move it. There is no break in the skin, but the arm looks funny. What emergency and first aid measures should you take?

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Assignment Sheet 1

10. Supervisor Steve is complaining of chest pain and indigestion. He says, "It must be something I ate." His breathing is difficult, and he looks pale and worried. What emergency and first aid measures should you take?

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